V08082

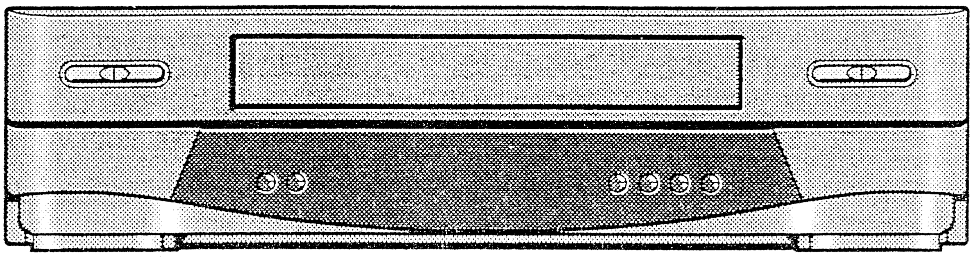
SANYO

FILE NO.

Service Manual

Video Cassette
Recorder

VHR-390G (Germany)
VHR-390EV
(Switzerland & Austria)



VHS
PAL

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CIRCUIT DIAGRAMS (Refer to the separate volume)

Please see other materials with Reference No. given in table below.

Materials	Model No.	Reference No.
Mechanism Manual	P90 Mechanism	WM-530599
	'92 Midi Mid-Mount Mechanism	MS 531206

PRODUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage and voltage ratings shown.

NOTE: 1. Parts order must contain Model Number, Part Number and Description.
2. Substitute parts may be supplied as the service parts.
3. N.S.P.: Not available as service parts.

REFERENCE No. SM531252

1. DISASSEMBLY

1-1. REMOVAL OF CABINET, MECHANISM UNIT AND MAIN BOARD

REMOVING THE CABINET PARTS (Fig. 1.1.1)

1. Remove the cabinet and bottom cover by removing the four screws (A) and five screws (B).
2. Remove the front panel by removing the locks of the clamps (C) using a screwdriver, etc. and slightly rotating the bottom part in the direction of the arrow.

NOTE: Electrical adjustments for the this model can be performed with only the cabinet removed.

REMOVING THE MECHANISM MAIN UNIT (Fig. 1.1.2)

After removing the cabinet parts:

1. Remove the 12-pin connector from CN511 and the two screws (D), and then remove the PW-1 PWB Ass'y.
2. Remove the two red screws (E), and then remove the TN-5 PWB. It is not necessary to remove the cables connected between the TN-5 PWB and CP-1 PWB Ass'y.
3. Remove the 6-pin connector from the ACE head, and the 2-pin connector and 24-wire flat cable from the MC-2 PWB.
4. Remove the flat cable from the Cylinder Ass'y, then the two screws (F), and finally the VP-1PWB Ass'y. It is not necessary to remove the two party cables connected between the VP-1 PWB Ass'y and CP-1 PWB Ass'y .
5. Remove the mechanism main unit by removing the two screws (G) and two screws (H). Remove, as well, the two screws (J) at the cassette tray side while pressing the tray lock lever as shown in the enlarged view and pushing the cassette tray to the position where the two screws (J) appear.

REMOVING THE CP-1 PWB ASSEMBLY (Fig. 1.1.3)

After removing the cabinet parts and the mechanism unit:

1. Pull out the TM-1 PWB Ass'y from CN301 and CN302 while pressing and spreading out the four clamps (K) as shown by the arrows.
2. Remove the holder set to the opening of the chassis, while pressing the clamp in the direction of the arrow.
3. Remove the two red screws (L). and the screw (P). Next, remove the CP-1 PWB Ass'y by lifting it straight up while pressing and spreading out the two clamps (M) as shown by the arrows.

M-TP4H/E-1

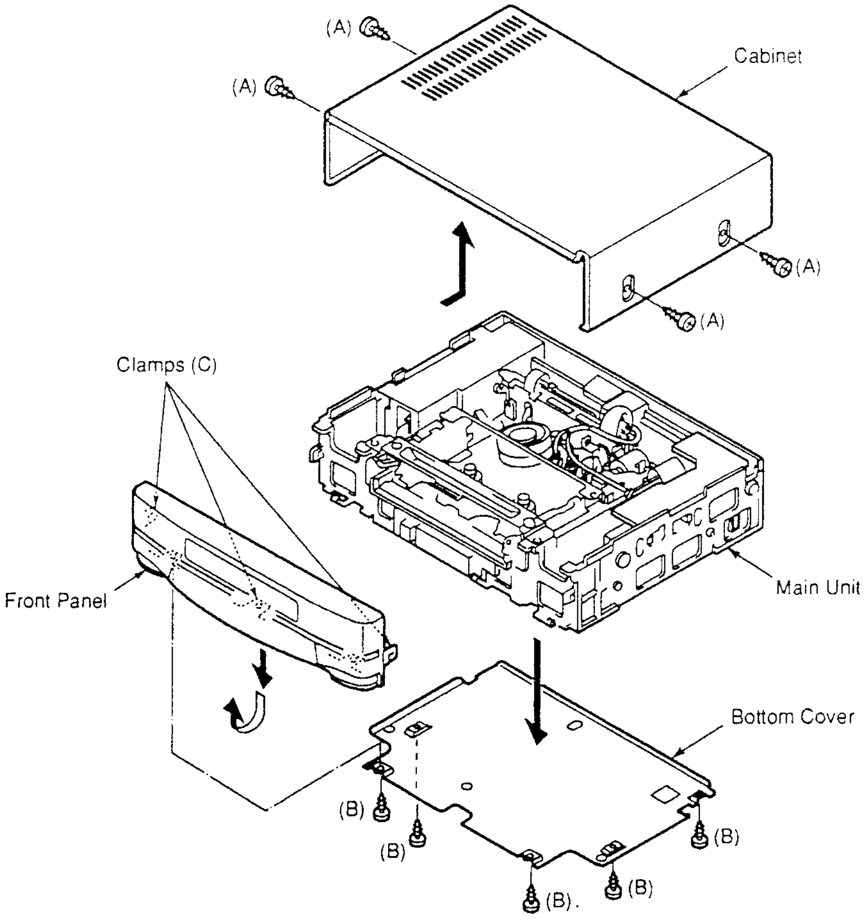


Fig. 1.1.1

M-TP4H/E 2

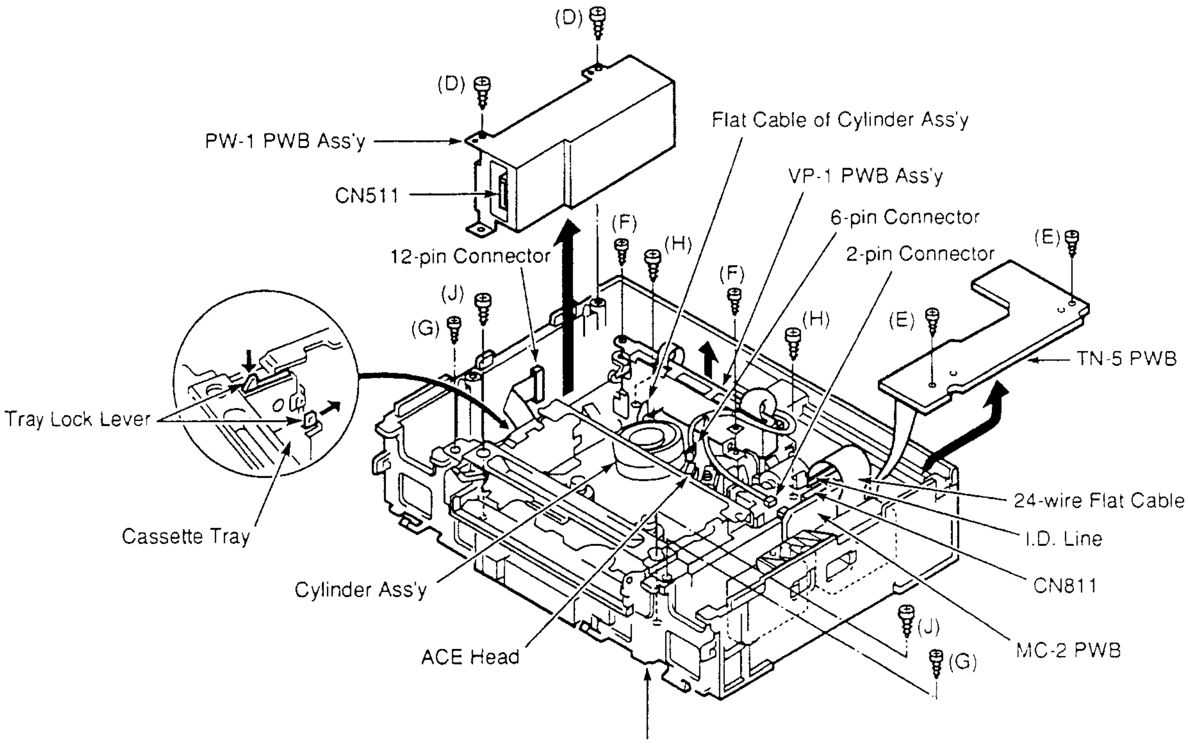

(D)
(D)
PW-1 PWB Ass'y
CN511
Flat Cable of Cylinder Ass'y
VP-1 PWB Ass'y
6-pin Connector
2-pin Connector
(E)
12-pin Connector
(F)
(H)
(F)
(J)
(G)
(H)
(E)
TN-5 PWB
Tray Lock Lever
Cassette Tray
24-wire Flat Cable
I.D. Line
CN811
Cylinder Ass'y
ACE Head
(J)
(G)
MC-2 PWB
Main Unit

Fig. 1.1.2

M-TP4H/E-3

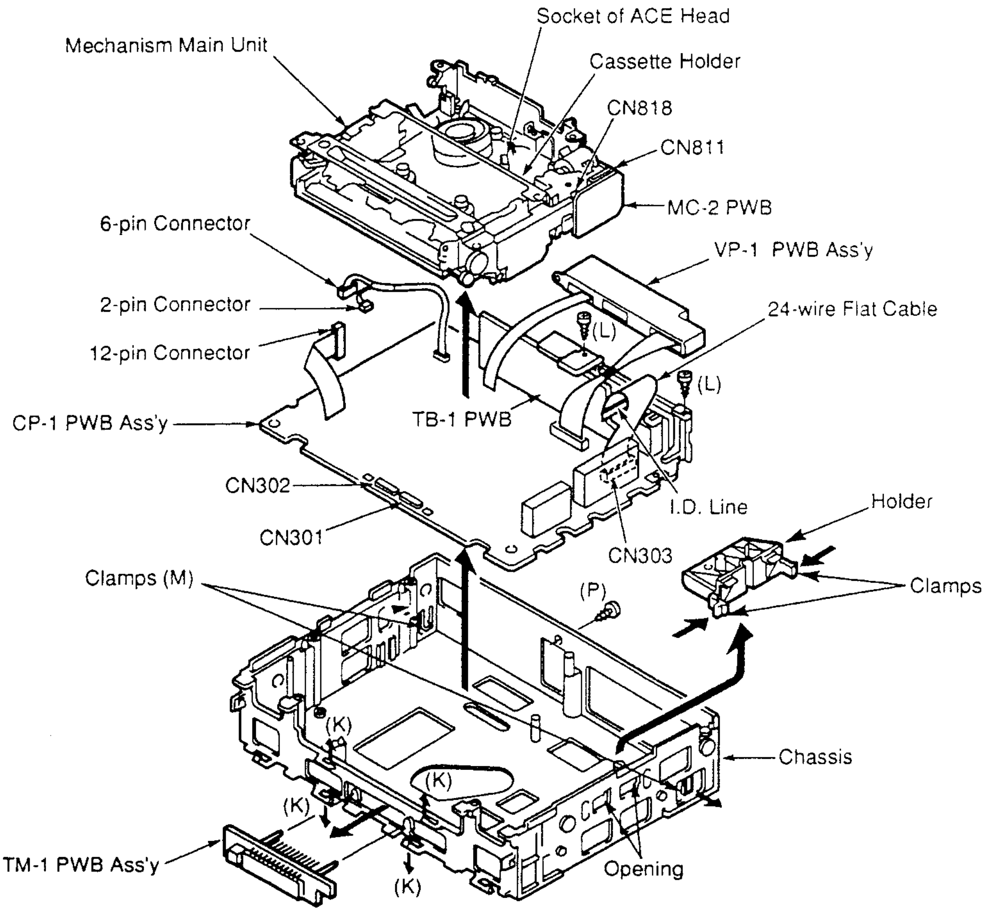

Socket of ACE Head
Mechanism Main Unit
Cassette Holder
CN818
CN811
MC-2 PWB
6-pin Connector
VP-1 PWB Ass'y
2-pin Connector
24-wire Flat Cable
(L)
12-pin Connector
(L)
CP-1 PWB Ass'y
TB-1 PWB
CN302
I.D. Line
Holder
CN301
CN303
Clamps (M)
(P)
Clamps
(K)
(K)
Chassis
(K)
TM-1 PWB Ass'y
(K)
Opening

Fig. 1.1.3

TEMPORARILY SETTING UP AND CONNECTING MAIN PWB ASSEMBLY

The following is an example of how to place and connect the main PWB not requiring a jig, when repairing the CP-1 PWB assembly (Fig. 1.1.4)

1. Place the mechanism main unit at the fixed position on the chassis.
2. Insert the VP-1 PWB Ass'y at the fixed position of the mechanism unit and connect the flat cable of the cylinder assembly.
3. Connect the 24-wire flat cable and the 2-pin connector to the MC-2 PWB, and then connect the 6-pin connector to the ACE head.
4. Connect the TM-1 PWB Ass'y to operate the VCR by using the remote control, and then connect the 12-pin connector to the CN511 for the PW-1 PWB Ass'y.
5. Place the CP-1 PWB Ass'y above the mechanism main unit along the cassette holder. Insert the tip (N) of the terminal board into the opening (O) at the side of the chassis, as shown in the enlarge view.

M-TP4H/GIT-4

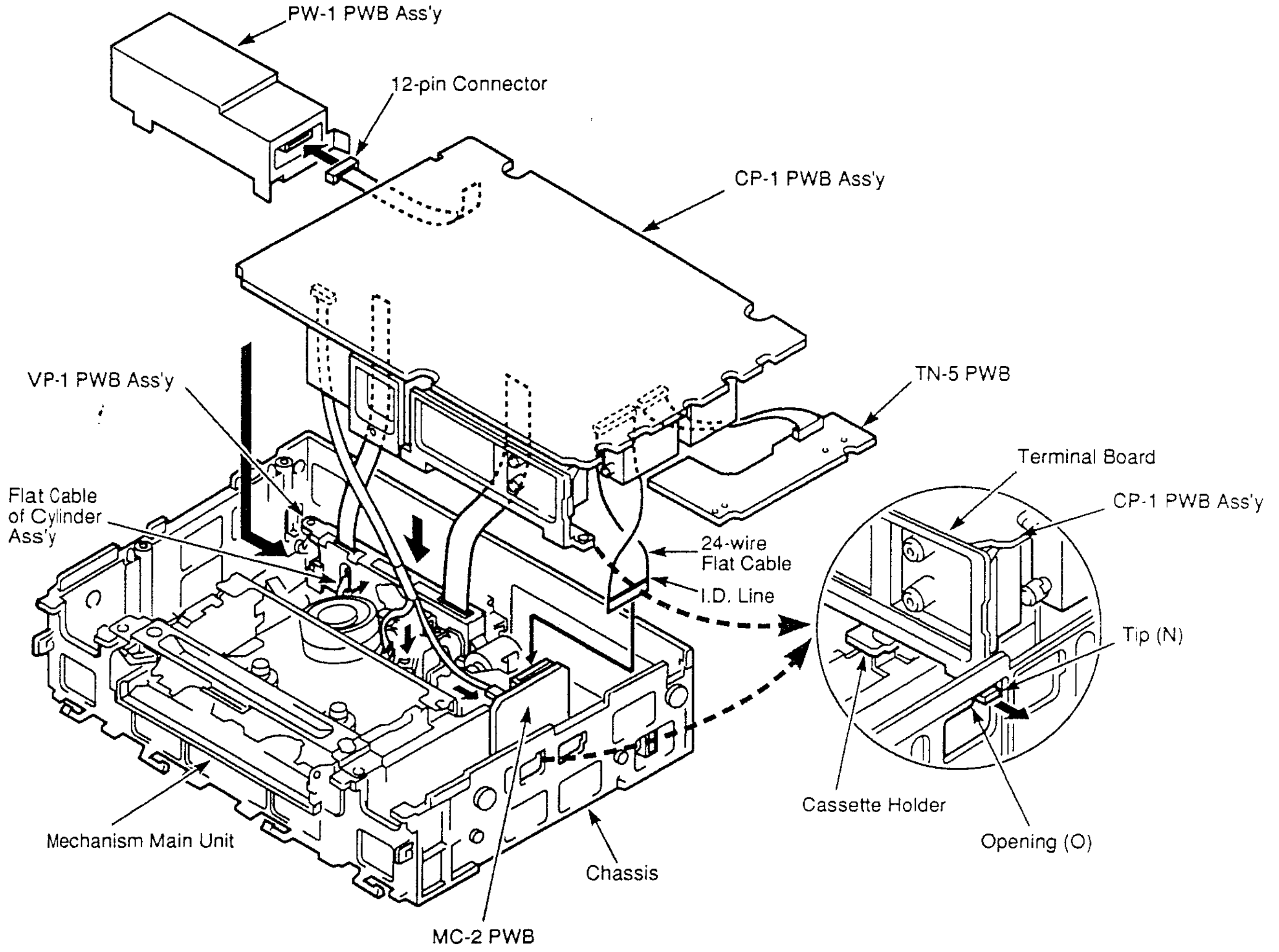

PW-1 PWB Ass'y
12-pin Connector
CP-1 PWB Ass'y
VP-1 PWB Ass'y
TN-5 PWB
Terminal Board
CP-1 PWB Ass'y
Flat Cable of Cylinder Ass'y
24-wire Flat Cable
I.D. Line
Tip (N)
Cassette Holder
Opening (O)
Mechanism Main Unit
Chassis
MC-2 PWB

Fig. 1.1.4

1-2. MAIN CIRCUIT BOARD

L-TP4H/GIT

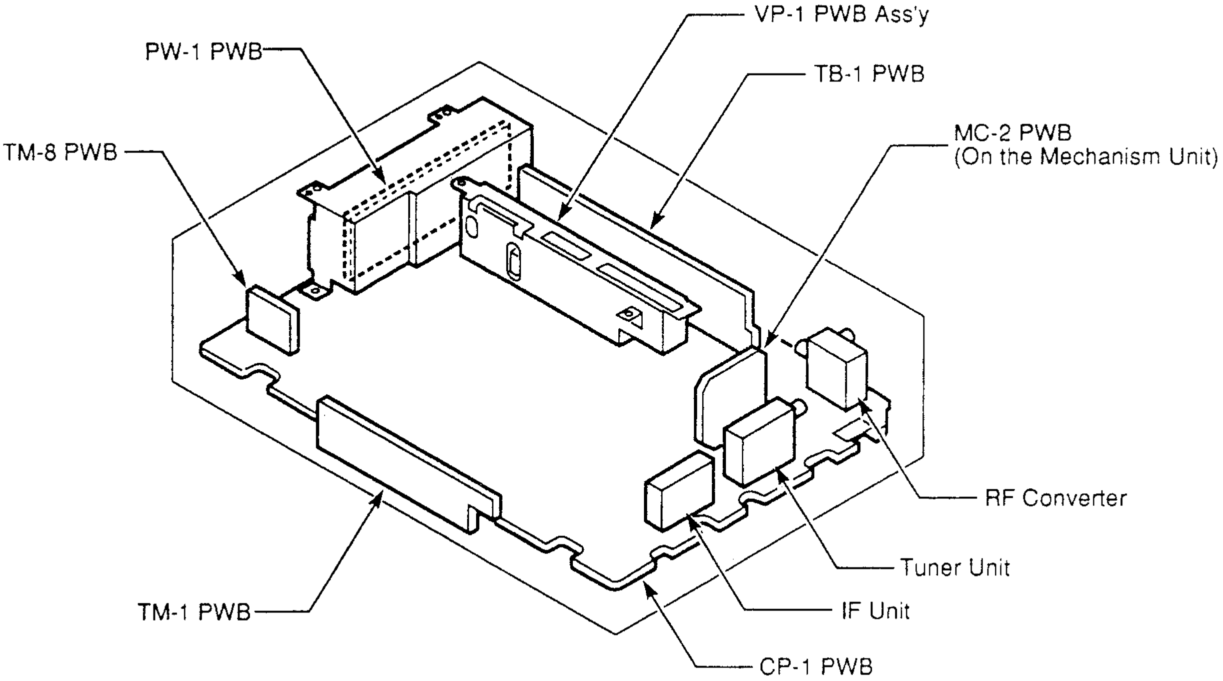

VP-1 PWB Ass'y
PW-1 PWB
TB-1 PWB
MC-2 PWB
(On the Mechanism Unit)
TM-8 PWB
RF Converter
Tuner Unit
TM-1 PWB
IF Unit
CP-1 PWB

Fig. 1.2.1

2. ELECTRICAL ADJUSTMENT

PREPARATION

This VCR need 4 basic presetting by using the menus displayed on-screen.
After all connection have been made, then follow steps 1 to 4 to preset the VCR.
The 4 presetting steps will be displayed in sequence on TV screen. The setting are entered with the remote control.

Turn on the VCR

1. Adjusting the TV receiver to the video channel: The WELCOME screen will appear. When the video channel has been preset, press the OK button on the remote control.
2. Language selection: Select the desired language, then press the OK button.
3. Clock setting: Using the remote control numeric buttons, enter the date and time, press the OK button.
4. Tuning control adjustments: When the channel position has been preset, press the MENU/TV button.
   When steps 1 to 4 have been finish, ready to operate the all operating mode.

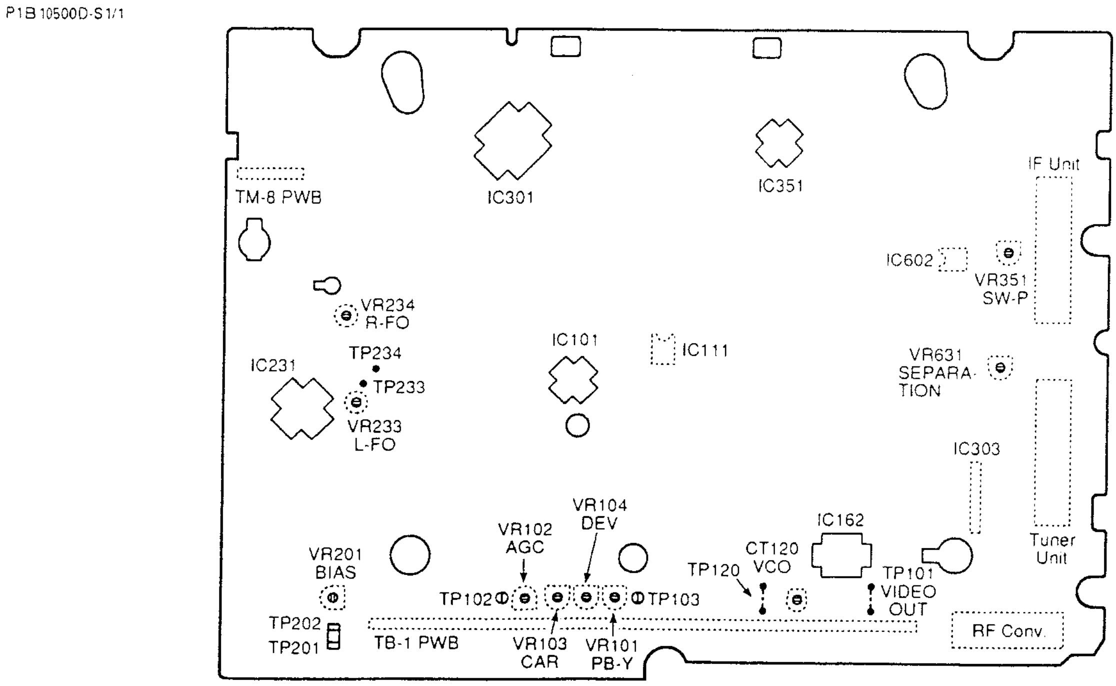
2-1. SERVO CIRCUIT ADJUSTMENT

- These adjustments should be carried out upon completion of the tape transport adjustments.
- If the tape transport adjustments (except the tilt adjustment) are carried out after these adjustments, follow the procedures again in Section 2-1-3. SWITCHING POSITION ADJ.
- When a cassette tape is loaded, auto-tracking will be set immediately after starting the first playback. As this will deviate the tracking center set, be sure to press the channel buttons (+) or (–) once directly after starting playback to prevent auto-tracking from being set.

2-1-1. TEST EQUIPMENT AND STANDARDS REQUIRED

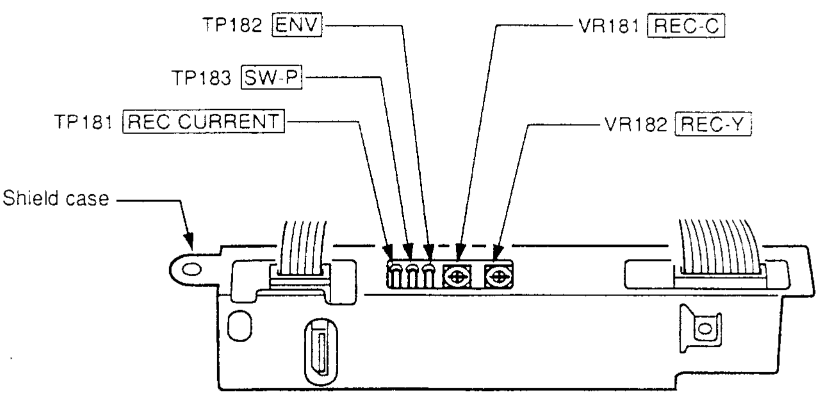
Oscilloscope	Vertical sensitivity: 5 mV/DIV, external trigger Band width: more than 10 MHz
Test Tape	VHJ-0009 or VHJ-0023: SP mode, monoscope, 6 KHz
Blank Tape	VHS-type cassette tape
Monitor TV	

2-1-2. LOCATION OF ADJUSTMENT POINTS


P1B 10500D-S1/1
TM-8 PWB
IC301
IC351
IF Unit
IC602
VR351
SW-P
VR234
R-FO
TP234
TP233
IC231
VR233
L-FO
IC101
IC111
VR631
SEPARA-
TION
IC303
VR104
DEV
VR102
AGC
IC162
VR201
BIAS
CT120
VCO
TP120
TP101
VIDEO
OUT
Tuner
Unit
TP102
TP103
TP202
TP201
TB-1 PWB
VR103
CAR
VR101
PB-Y
RF Conv.

CP-1 PWB (FOIL SIDE)

Fig. 2.1.1


P1B10200D S1
TP182 ENV
TP183 SW-P
TP181 REC CURRENT
Shield case
VR181 REC-C
VR182 REC-Y

VP-1 PWB ASS'Y

Fig. 2.1.2

NOTE:

- Self-recording means "Record any broadcasting or video signal and play back the just-recorded portion".

2-1-3. SWITCHING POSITION ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP101 (VIDEO OUT) TP183 (SW-P)	Oscilloscope	PLAY(SP)mode Test tape (VHJ-0009 or VHJ-0023)

ADJ. Location	ADJ. Value
VR351 (SW-P)	6.5 H ± 0.5 H

1. Set the tracking control position to the center by pressing CHANNEL buttons (+) and (–) simultaneously. (Tracking center position display in the indicator panel "T -:- ")
2. Adjust VR351 (SW-P) so that the width "T" becomes **6.5 H ± 0.5 H** as shown in Fig. 2.1.3.

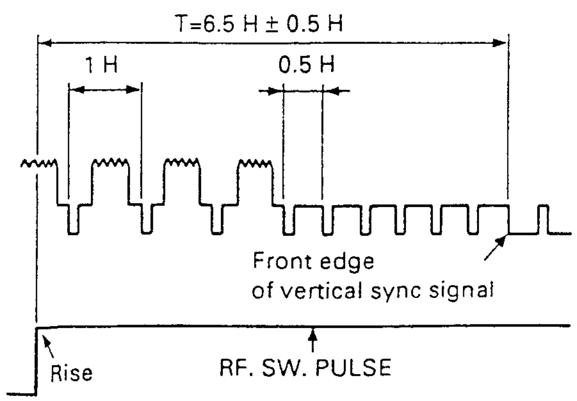

WFS101
T=6.5 H ± 0.5 H
1 H
0.5 H
Front edge of vertical sync signal
Rise
RF. SW. PULSE

Fig. 2.1.3

2-1-4. STILL V-LOCK ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
Picture of monitor TV	Color bar generator or Broadcasting Monitor	Self-recording (SP mode) STILL mode Blank tape
		Self-recording (LP mode) STILL mode Blank tape

ADJ. Location	ADJ. Value
CHANNEL (+) button CHANNEL (–) button	The minimum vertical shake

1. Play back the just-recorded portion and then set the VCR in the STILL mode.
2. Press the CHANNEL (+) button or the CHANNEL (–) button so that any vertical shake of the picture is brought to its minimum.

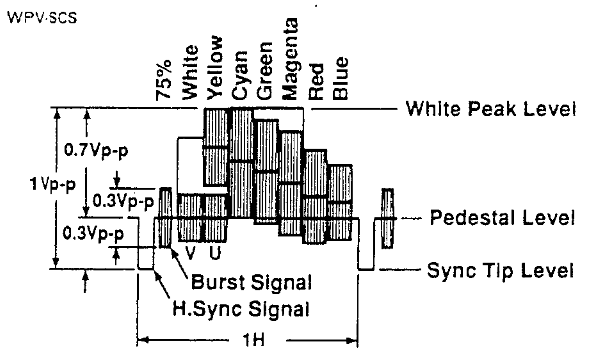
2-2. VIDEO CIRCUIT ADJUSTMENT

- Before making the following adjustments, Section 2-1. SERVO CIRCUIT ADJUSTMENT should be completed.
- Use the relay jig to provide simple adjustment of the VP-1 PWB Ass'y.

2-2-1. TEST EQUIPMENT AND STANDARDS REQUIRED

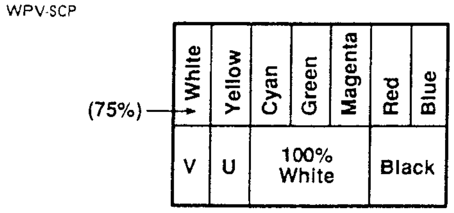
Color Bar Signal Generator	PAL Color bar signel with 100% white level (EBU color bar signel) (Signal waveform is described below. Refer to Fig. 2.2.1)
Oscilloscope	Vertical sensitivity: 5 mV/DIV, external trigger Band width: more than 10 MHz
Digital Voltmeter	DC range
Test Tape	VHJ-0008 or VHJ-0023: SP mode, color bar, 1 kHz (Color bar signal waveform is described below. Refer to Fig. 2.2.3)
Blank Tape	VHS-type cassette tape
Oscilloscope Probe	Input capacity: less than 25 pF (10:1) less than 40 pF (1:1) Covering frequency: DC ~ 40 MHz (10:1) DC ~ 30 MHz (1:1)
Frequency Counter	8 significant digits
Adjustment Relay Jig	VHJ-0067: 12-wire flat cable for VP-1 PWB Ass'y

PAL TV TEST SIGNAL


WPV-SCS
75%
White
Yellow
Cyan
Green
Magenta
Red
Blue
White Peak Level
0.7Vp-p
1Vp-p
0.3Vp-p
0.3Vp-p
Pedestal Level
V
U
Burst Signal
H.Sync Signal
Sync Tip Level
1H

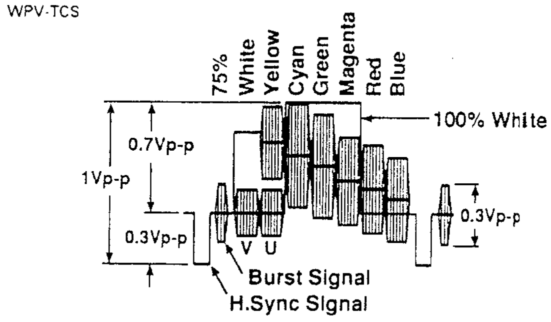
COLOR BAR SIGNAL WAVEFORM

Fig. 2.2.1


WPV-SCP
(75%)
White
Yellow
Cyan
Green
Magenta
Red
Blue
V
U
100% White
Black

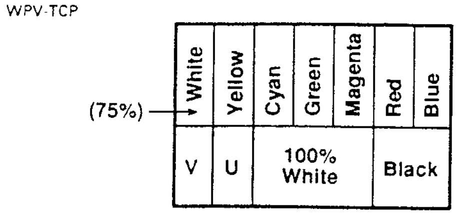
COLOR BAR PATTERN MONITOR TV

Fig. 2.2.2


WPV-TCS
75%
White
Yellow
Cyan
Green
Magenta
Red
Blue
100% White
0.7Vp-p
1Vp-p
0.3Vp-p
0.3Vp-p
V
U
Burst Signal
H.Sync Signal

COLOR BAR SIGNAL WAVEFORM (VHJ-0008)

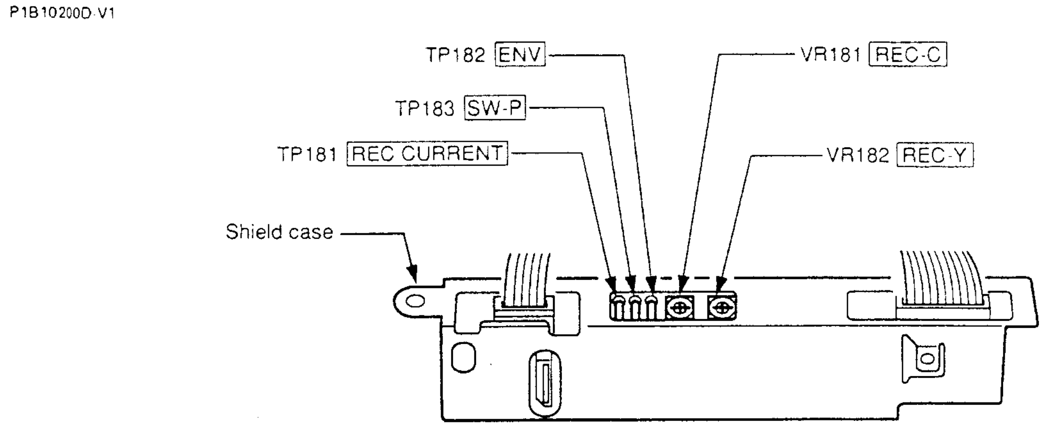
Fig. 2.2.3


WPV-TCP
(75%)
White
Yellow
Cyan
Green
Magenta
Red
Blue
V
U
100% White
Black

COLOR BAR PATTERN (VHJ-0008) ON MONITOR TV

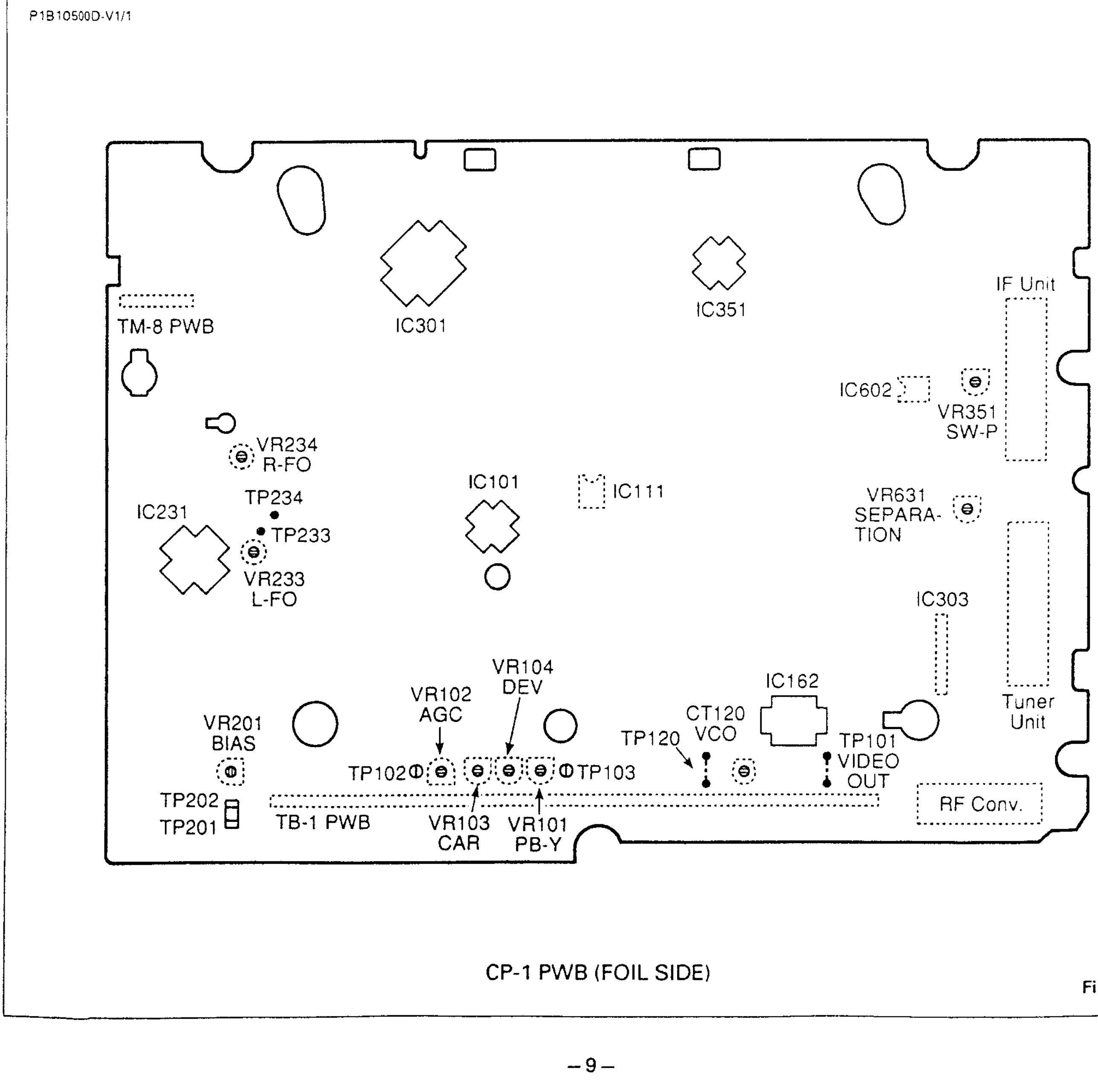
Fig. 2.2.4

2-2-2. LOCATION OF ADJUSTMENT POINTS


P1B10200D-V1
TP182 ENV
TP183 SW-P
TP181 REC CURRENT
VR181 REC-C
VR182 REC-Y
Shield case

VP-1 PWB ASS'Y

Fig. 2.2.5


P1B10500D-V1/1
TM-8 PWB
IC301
IC351
IF Unit
IC602
VR351
SW-P
VR234
R-FO
IC101
IC111
IC231
TP234
TP233
VR233
L-FO
VR631
SEPARA-
TION
IC303
VR104
DEV
VR102
AGC
IC162
CT120
VCO
VR201
BIAS
TP120
TP101
VIDEO
OUT
TP102
TP103
Tuner
Unit
TP202
TP201
TB-1 PWB
VR103
CAR
VR101
PB-Y
RF Conv.

CP-1 PWB (FOIL SIDE)

Fig. 2.2.6

2-2-3. ADJUSTMENT RELAY JIG

Connect the Flat cable end from the Cylinder Ass'y to the VP-1 PWB Ass'y using the Relay jig to provide simple repairing and adjustment of the VP-1 PWB Ass'y, as shown in Fig. 2.2.7. Further, when adjusting the VP-1 PWB Ass'y, be sure to make contact an end of Shield case with Bracket of the VP-1 PWB Ass'y to maintain the shield effect. If the VP-1 PWB Ass'y does not contact, there is insufficient ground and no proper play back image can be obtained.

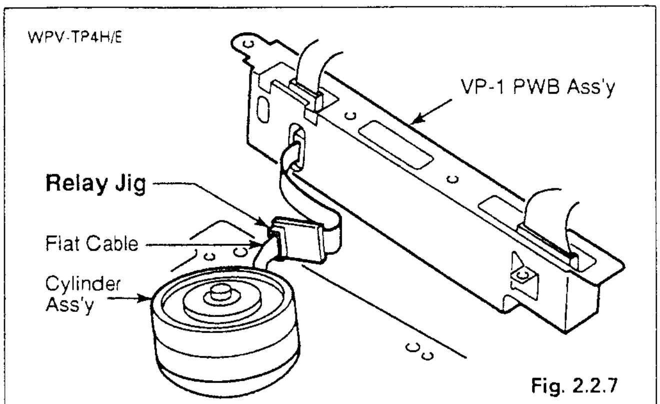


Fig. 2.2.7

NOTES:

- Self-recording means "Record the video signal and play back the just-recorded portion".
- Connect the monitor TV to the VIDEO OUTPUT terminal (EURO-AV1 terminal pin 19), before making following adjustments.

2-2-4. AGC LEVEL ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP102	Color bar generator Oscilloscope (10:1 probe)	E-E mode

ADJ. Location	ADJ. Value
VR102 (AGC)	0.5 Vp-p ± 0.025 Vp-p

1. Connect the color bar generator to the VIDEO INPUT terminal (EURO-AV1 pin20).
2. Adjust VR102 (AGC) for **0.5 Vp-p ± 0.025 Vp-p** as shown in Fig. 2.2.8.

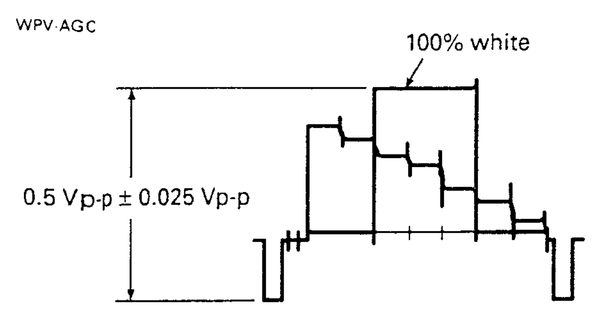


Fig. 2.2.8

2-2-5. PB-Y LEVEL ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP101	Oscilloscope	PLAY(SP)mode Test tape (VHJ-0008 or VHJ-0023)

ADJ. Location	ADJ. Value
VR101 (PB-Y)	1 Vp-p ± 0.05 Vp-p

1. Play back a test tape in SP mode.
2. Adjust VR101 (PB-Y) for the video luminance signal level of **1 Vp-p ± 0.05 Vp-p**. (Refer to Fig. 2.2.9)

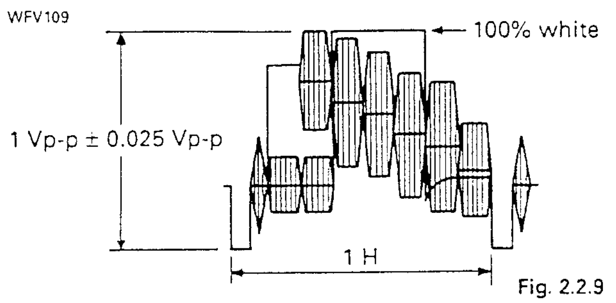


Fig. 2.2.9

2-2-6. CARRIER SET ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP103	Color bar generator Frequency counter	REC (SP) mode

ADJ. Location	ADJ. Value
VR103 (CAR)	3.83 MHz ± 0.05 MHz

1. Connect the color bar generator to the VIDEO INPUT terminal (EURO-AV1 pin 20).
2. After removing the first color bar signal input from the video input terminal, immediately adjust VR103 (CAR) so that the frequency becomes **3.83 MHz ± 0.05 MHz**.

2-2-7. VCO (on screen assist) ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP120	Color bar generator Digital voltmeter	E-E mode

ADJ. Location	ADJ. Value
CT120 (VCO)	2.5 Vp-p ± 0.3 Vp-p

1. Connect the digital voltmeter (DC range) to TP120 and GND.
2. Adjust CT120 (VCO) so that the voltage is **2.5 V ± 0.3 V**.

2-2-8. DEVIATION ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP101	Color bar generator Oscilloscope	Self-recording (SP) mode Blank tape

ADJ. Location	ADJ. Value
VR104 (DEV)	1 Vp-p ± 0.05 Vp-p

1. Record the color bar signal on the blank tape.
2. Play back of the just-recorded portion.
3. Adjust VR104 (DEV) for **1 Vp-p ± 0.05 Vp-p** as shown in Fig. 2.2.10.
4. If the adjustment value is not satisfactory, adjust VR104 (DEV) and repeat steps 2 to 3.

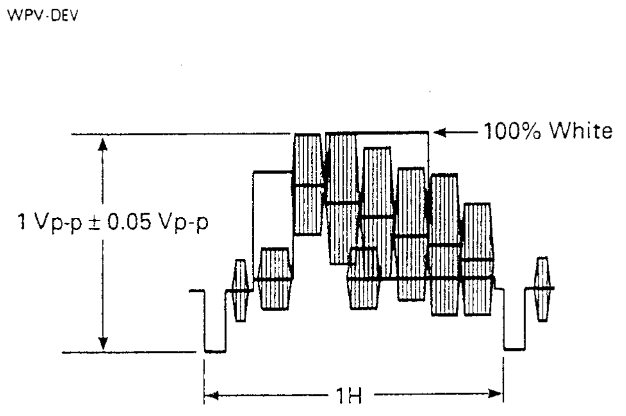


Fig. 2.2.10

2-2-9. C REC CURRENT ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP181 (on VP-1 PWB)	Color bar generator Oscilloscope (1:1 probe)	REC (SP) mode Blank tape

ADJ. Location	ADJ. Value
VR181 (REC-C)	150 mVp-p ± 5 mVp-p

1. Connect the ground of the oscilloscope to the shield case of the VP-1 PWB Ass'y.
2. Adjust VR182 (REC-Y) for the minimum video luminance signal level.
3. Adjust VR181 (REC-C) so that the video chrominance signal level is **150 mVp-p ± 5 mVp-p**. (Refer to Fig. 2.2.11)

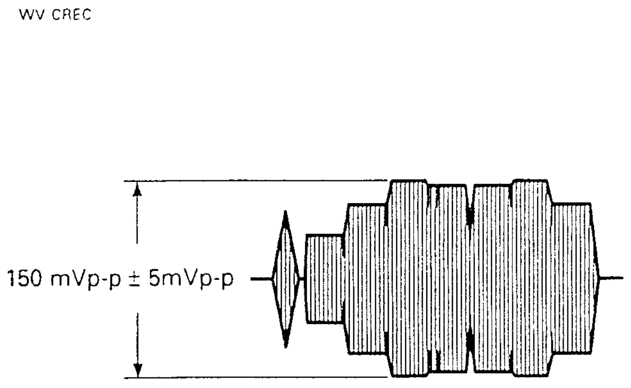


Fig. 2.2.11

2-2-10. Y REC CURRENT ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP181 (on VP-1 PWB)	Color bar generator Oscilloscope (1:1 probe)	REC(SP)mode Blank tape

ADJ. Location	ADJ. Value
VR182 (REC-Y)	470 mVp-p ± 10 mVp-p

1. Connect the ground of the oscilloscope to the shield case of the VP-1 PWB Ass'y.
2. Adjust VR182 (REC-Y) so that the video luminance signal level at the sync tip is **470 mVp-p ± 10 mVp-p**. (Refer to Fig. 2.2.12)

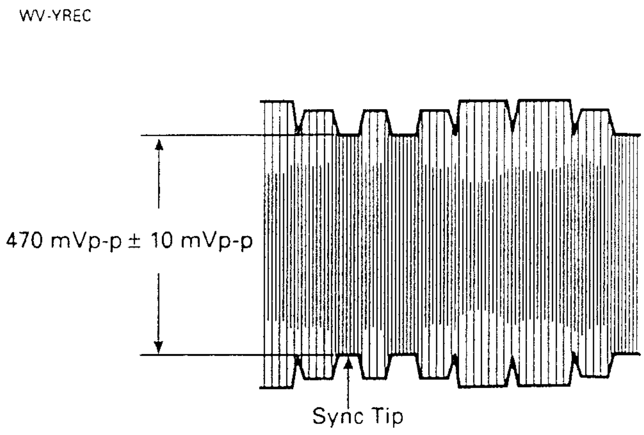


Fig. 2.2.12

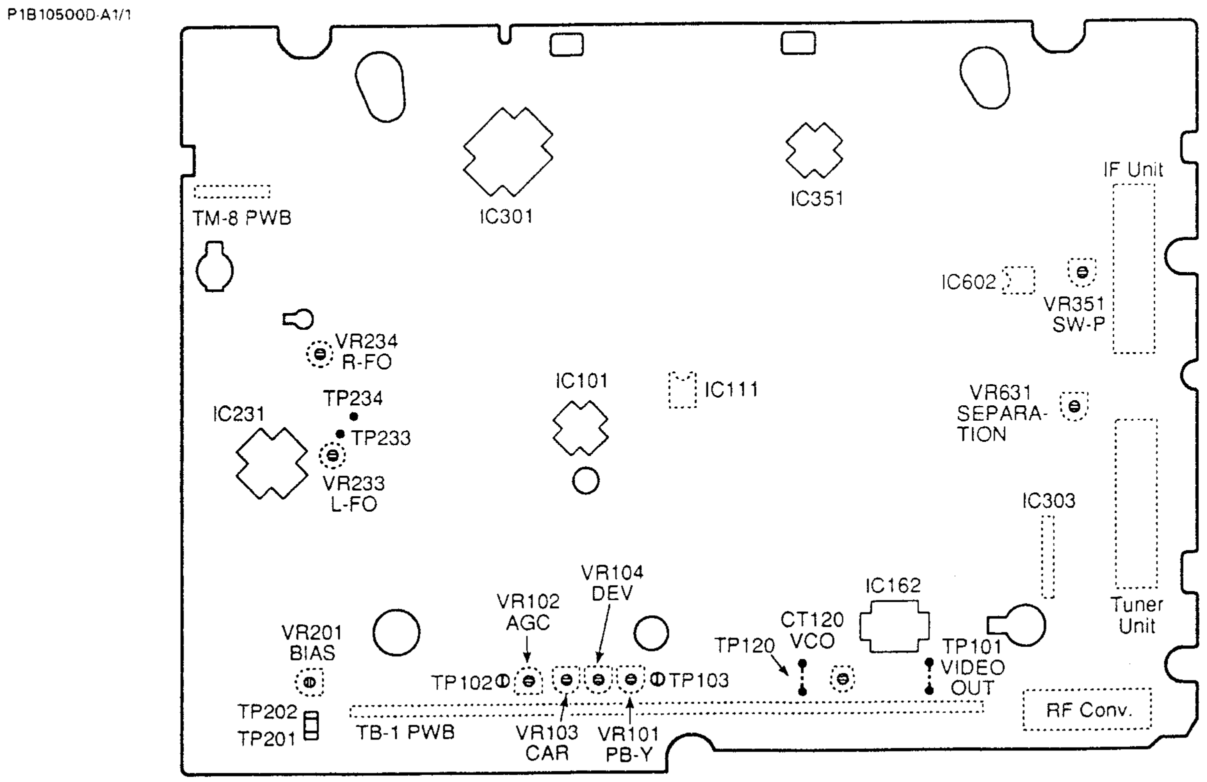
2-3. AUDIO FM (Hi-Fi)/ NORMAL CIRCUIT ADJUSTMENT

- Before making these adjustments, (especially, the tape guide height and audio control erase head height adjustments) should be carried out, so that the tape traveling between the loading guide pole and the audio control erase head runs without fluttering, twisting, curling.
- Before making these adjustments, Section 2-1. SERVO and Section 2-2. VIDEO circuit adjustments should be carried out.

2-3-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Standard Audio Signal Generator (SG)	Output frequency : 10 Hz ~ 100 kHz Output level : more than 1 Vrms Output impedance : 600 Ω Distortion ratio : less than 0.1% Output in use SG : Frequency: .... 1 kHz, 10 kHz (switchable) Output level: .... –33.8 dBs ± 0.5 dB
Color Bar Signal Generator	Color bar signel with 100% white level. (Signal waveform is described before. Refer to Fig. 2.2.1)
Oscilloscope	Vertical sensitivity : 10 mV/DIV Band width : more than 30 MHz
AC Voltmeter	Effective value indication Input frequency : 10 Hz ~ 20 kHz Input Impedance : more than 1 MΩ Measurement level : 1mV (full scale)
Frequency Counter	Input frequency : 20 Hz ~ 10 MHz
Blank Tape	VHS-type cassette tape

2-3-2. LOCATION OF ADJUSTMENT POINTS


P1B10500D-A1/1
TM-8 PWB
IC301
IC351
IF Unit
IC602
VR351
SW-P
VR234
R-FO
IC231
TP234
TP233
VR233
L-FO
IC101
IC111
VR631
SEPARA-
TION
IC303
Tuner
Unit
VR104
DEV
VR102
AGC
IC162
CT120
VCO
VR201
BIAS
TP120
TP101
VIDEO
OUT
TP102
TP103
TP202
TP201
TB-1 PWB
VR103
CAR
VR101
PB-Y
RF Conv.

CP-1 PWB (FOIL SIDE)

Fig. 2.3.1

AUDIO NORMAL CIRCUIT

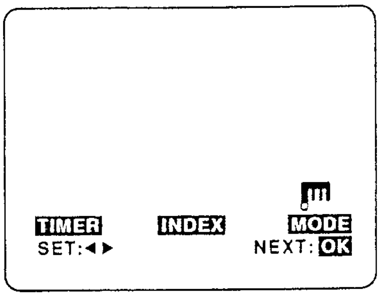
NOTES:

- Set the following switch or On-screen menu to the positions indicated below, before making following adjustments.

SWITCH or ON-SCREEN MENU	POSITION
TAPE SPEED	SP
O/AV	AV
AV	AV1
AUDIO	MONO

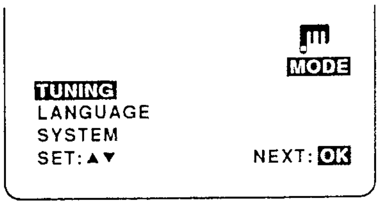
To select AV and AUDIO mode

1. Press the MENU/TV button on the remote control, The MAIN MENU appears.
   "MODE" is selected, then press the OK button.



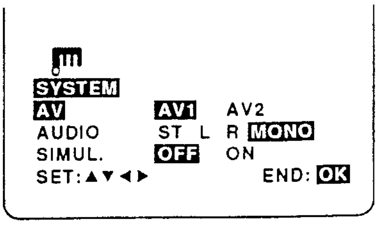
TIMER INDEX MODE
SET:◀▶ NEXT: OK

2. MODE SETTING menu will appear.
   "SYSTEM" is selected, then press the OK button.



MODE
TUNING
LANGUAGE
SYSTEM
SET:▲▼ NEXT: OK

3. RECORDING AND PLAYBACK SYSTEM SETTING menu will appear.
   "AV" : "AV1" and "AUDIO" : "MONO" are selected, press the OK button.



SYSTEM
AV AV1 AV2
AUDIO ST L R MONO
SIMUL. OFF ON
SET:▲▼◀▶ END: OK

- Self-recording means "Record the AUDIO signal and play back the just-recorded portion.

2-3-3. BIAS LEVEL ADJ.

[A]

Measuring Point	Measuring Equipment	ADJ. Condition
TP201 (HOT) TP202 (GND)	Oscilloscope AC voltmeter Frequency counter	REC (SP) mode Blank tape

ADJ. Location	ADJ. Value
VR201 (BIAS)	24 mVrms

1. Load the VCR with a blank tape and select the SP record mode without all incoming signal.
2. After confirming on the oscilloscope that a 70 kHz sine wave is being output, adjust VR201 (BIAS) so that the AC voltmeter's reading is **24 mVrms**.

[B]

Measuring Point	Measuring Equipment	ADJ. Condition
AUDIO OUTPUT terminal (EURO-AV pin 3: Lch)	Oscilloscope AC voltmeter Standard audio signal generator (SG: signal -33.8 dBs, 1 kHz -33.8 dBs, 10 kHz)	Self-recording (SP mode Blank tape)

ADJ. Location	ADJ. Value
VR201 (BIAS)	-4 dB ~ +4 dB between 400 kHz and 10 kHz

1. Connect the standard audio signal generator to the AUDIO INPUT terminal (EURO-AV1 pin6: Lch).
2. Set the standard audio signal generator's output level to -33.8 dBs.
3. Set the standard audio signal generator's frequency to 400 Hz and then 10 kHz. Record each of these frequency signals.
4. Play back each of the just-recorded portion.
5. Confirm that the 10 kHz level on AC voltmeter's reading is **from -4 dB to +4 dB**, compared with 400 Hz level.
6. If the 10 kHz level is less than -4 dB below 400 Hz level or more than +4 dB above 400 Hz level, Rotate VR201 (BIAS) slightly to adjust it.
7. Repeat steps 3 through 6 if necessary.

AUDIO FM (Hi-Fi) CIRCUIT

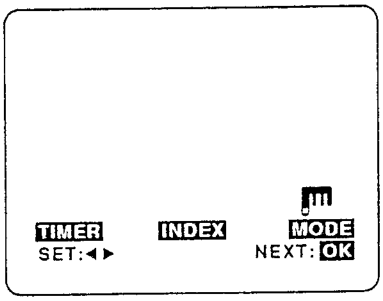
NOTES:

- Before making these adjustments, check that the surface of the parts touching the tape such as the A-FM head or guides are clean.
- Set the following switch or On-screen menu to the positions indicated below, before making following adjustments.

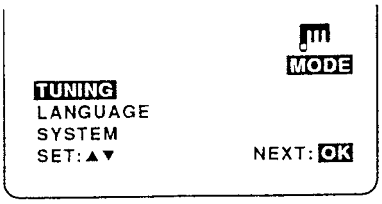
SWITCH or ON-SCREEN MENU	POSITION
TAPE SPEED	SP
O/AV	AV
AV	AV1
AUDIO	ST

To select AV and AUDIO mode

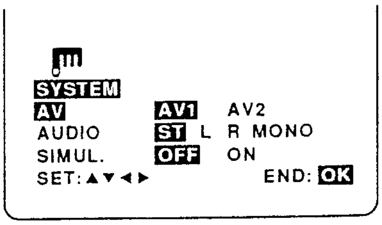
1. Press the MENU/TV button on the remote control, The MAIN MENU appears.
   "MODE" is selected, then press the OK button.



2. MODE SETTING menu will appear.
   "SYSTEM" is selected, then press the OK button.



3. RECORDING AND PLAYBACK SYSTEM SETTING menu will appear.
   "AV" : "AV1", "AUDIO" : "ST" are selected, press the OK button.



2-3-6. A-FM CARRIER FREQUENCY ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
TP233 (1.4 MHz) TP234 (1.8 MHz)	Frequency counter	REC (SP)mode Blank tape

ADJ. Location	ADJ. Value
VR233 (L-FO)	1.4 MHz +4/–6 kHz
VR234 (R-FO)	1.8 MHz +4/–6 kHz

1. Connect a frequency counter to TP233 (Lch), TP234 (Rch) and ground.
2. Adjust VR233 (L-FO) so that in the zero level signal status the frequency at TP233 becomes **1.4 MHz +4/–6 kHz**.
3. Adjust VR234 (R-FO) so that in the zero level signal status the frequency at TP234 becomes **1.8 MHz +4/–6 kHz**.

2-4. TUNER AND IF CIRCUITS ADJUSTMENT

- When any malfunction occurs in the TUNER circuit the whole unit must be replaced.
- An adjustment of the IF circuit is shown as follows.

NOTE: The TUNER unit does not need any adjustments, because precise adjustments have been done before shipment.

2-4-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Monitor TV	

2-4-2. LOCATION OF ADJUSTMENT POINT

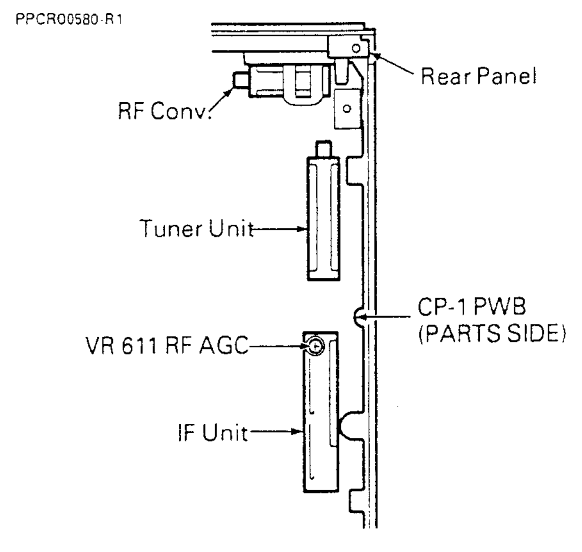


Fig. 2.4.1

2-4-3. RF AGC ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
Picture of monitor TV	Monitor TV	E-E mode

ADJ. Location	ADJ. Value
VR611 (RF AGC) (on the IF circuit)	S/N is best point

1. Connect the monitor TV to VHF/UHF ANTENNA OUTPUT terminal.
2. Connect the antenna to VHF/UHF ANTENNA INPUT terminal.
3. Receive the middle electrical field (70 dBμ ~ 90 dBμ) of the VHF high channel, and slowly turn VR611 (RF AGC) from the point where snow-noise is present to the point where it just disappears from the monitor TV.
4. Confirm by monitor TV that there is no beat and saturation (S/N is best point) when receiving any TV channel.

2-5. MTS DECODER CIRCUIT ADJUSTMENT

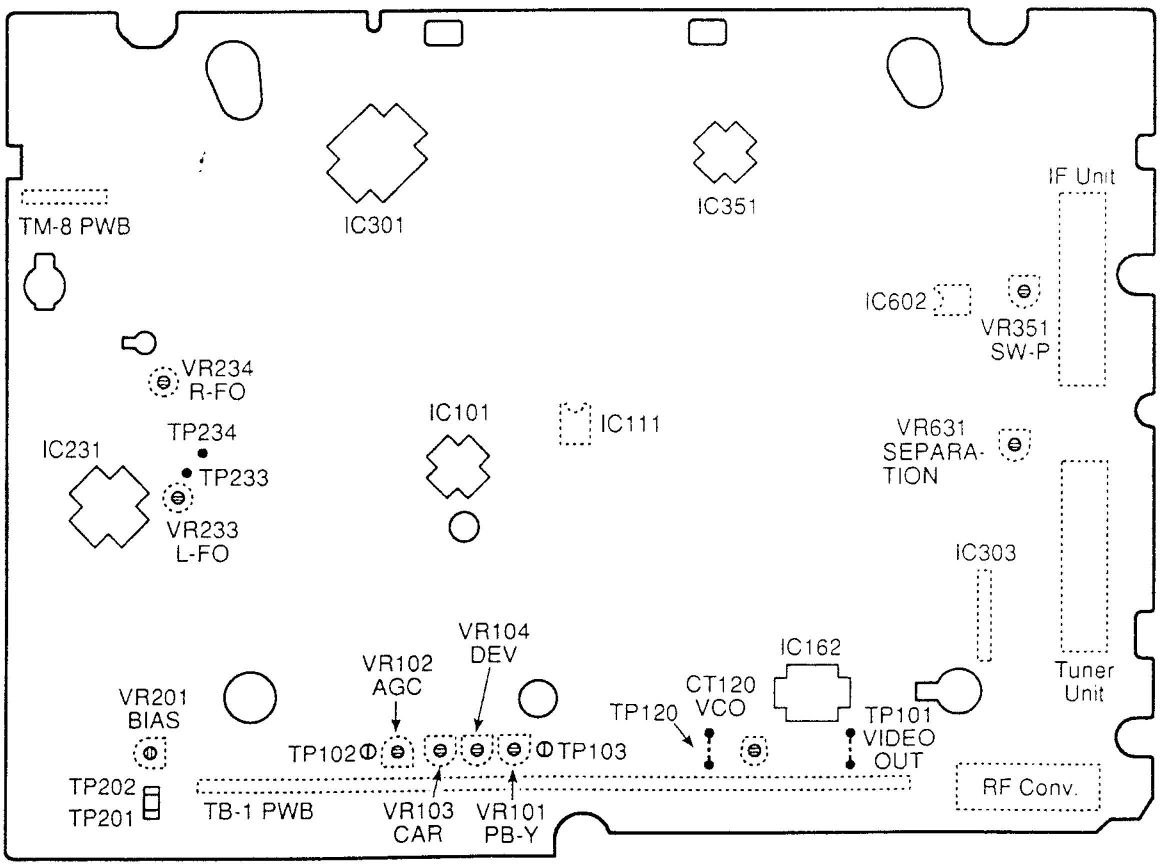
- If adjusting the MTS Decoder circuit, special equipment shown in section 2-5-1. is necessary.
- Improper adjustment will cause loss of performance of Stereo Sound and Bilingual Sound detection.
- Prior to making these adjustments, the other adjustments except the MTS Decoder should be completed.

2-5-1. TEST EQUIPMENT AND STANDARDS REQUIRED

Audio Multiplex TV signal Generator	
Oscilloscope	
AC Voltmeter	
Band Path Filter	200 Hz ~ 15 kHz

2-5-2. LOCATION OF ADJUSTMENT POINTS

P1B10500D-R2/1


TM-8 PWB
IC301
IC351
IF Unit
IC602
VR351
SW-P
VR234
R-FO
IC231
TP234
TP233
VR233
L-FO
IC101
IC111
VR631
SEPARA-TION
IC303
VR104
DEV
VR102
AGC
VR201
BIAS
IC162
CT120
VCO
TP120
TP101
VIDEO
OUT
Tuner
Unit
TP102
TP103
TP202
TP201
TB-1 PWB
VR103
CAR
VR101
PB-Y
RF Conv.

CP-1 PWB (FOIL SIDE)

Fig. 2.5.1

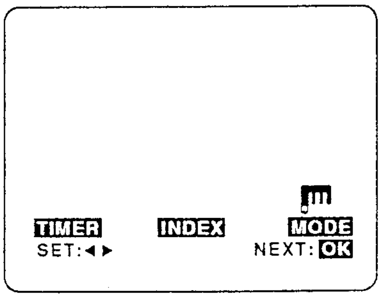
NOTE:

- Set the following switch or On-screen menu to the positions indicated below, before making following adjustments.

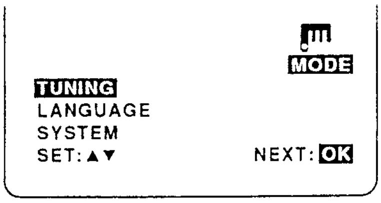
SWITCH or ON-SCREEN MENU	POSITION
TAPE SPEED	SP
O/AV	AV
AV	AV1
AUDIO	ST

To select AV and AUDIO mode

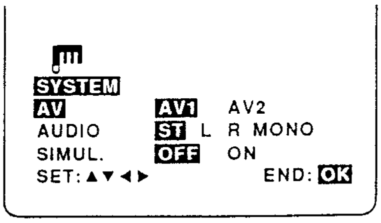
1. Press the MENU/TV button on the remote control, The MAIN MENU appears.
"MODE" is selected, then press the OK button.



2. MODE SETTING menu will appear.
"SYSTEM" is selected, then press the OK button.



3. RECORDING AND PLAYBACK SYSTEM SETTING menu will appear.
"AV" : "AV1", "AUDIO" : "ST" are selected, press the OK button.



2-5-3. SEPARATION ADJ.

Measuring Point	Measuring Equipment	ADJ. Condition
AUDIO OUTPUT Terminal EURO AV1 pin3 (Lch)	Audio Multiplex TV signal generator Oscilloscope Band path filter (200 Hz ~ 15 kHz)	E-E mode

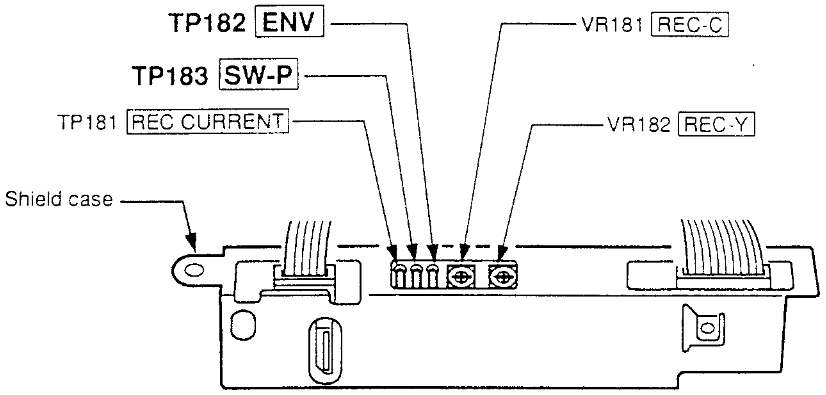
ADJ. Location	ADJ. Value
VR631 (SEPARATION)	Minimum level

1. Input the output signal of the Audio Multiplex TV signal generator into the VCR ANT input terminal.
2. Connect the oscilloscope to the AUDIO OUTPUT terminal EURO AV1 pin3 (Lch) of the VCR via the BPF.
3. Set the Audio Multiplex TV signal generator as follows.
   Audio signal Rch: 1kHz 100% modulation
   Audio signal Lch: Unmodulation
4. Adjust VR631 (SEPARATION) so that the output of the AUDIO OUTPUT terminal Lch) is brought to its minimum level.

3. TEST POINT FOR TAPE PATH ADJUSTMENT

Test point TP182 (ENV) and TP183 (SW-P) for tape path adjustment is shown in Figure below.
For adjustment, refer to the Mechanism Service Technical Information(WM-530599 and MS531206).

P1B10200D-T3



TP182 ENV
TP183 SW-P
TP181 REC CURRENT
Shield case
VR181 REC-C
VR182 REC-Y

VP-1 PWB ASS'Y

Fig. 3.1

4. PARTS LIST

LOCATION		PARTS NO.	DESCRIPTION
ACCESSORIES			
		645 002 6751	REMOCON(WITH COVER BATTERY)
		613 145 3227	COVER BATTERY(FOR REMOCON)
		613 145 5689	INSTRUCTION MANUAL(VHR-390G ONLY)
OR		613 149 3964	INSTRUCTION MANUAL(VHR-390EV ONLY)
		613 077 4415	CABLE,ANT(VHR-390G ONLY)
OR		613 132 6125	CABLE,ANT(VHR-390G ONLY)
OR		613 096 6773	CABLE,ANT(VHR-390EV ONLY)
OR		613 011 7359	CORD(VHR-390EV ONLY)
OR		613 132 6132	CABLE,ANT(VHR-390EV ONLY)
OR		613 132 5975	CORD(VHR-390EV ONLY)
	⚠	613 095 0550	CORD,POWER
OR	⚠	613 133 2393	CORD,POWER
OR	⚠	645 002 6805	CORD,POWER
OR	⚠	645 003 3766	CORD,POWER

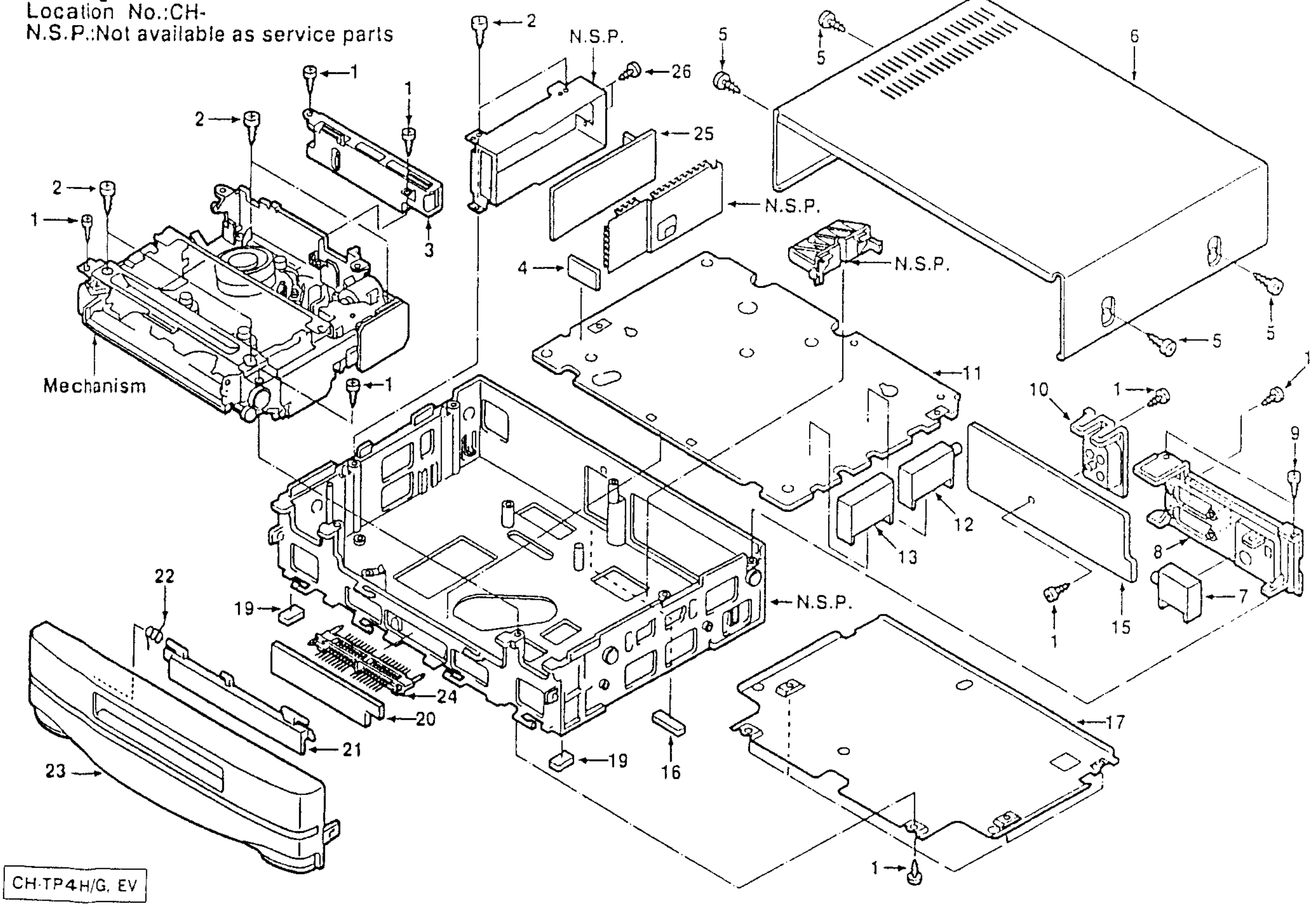
****

LOCATION	PARTS NO.	DESCRIPTION
PACKING MATERIALS		
	613 147 5373	CARTON CASE(VHR-390G ONLY)
OR	613 149 4350	CARTON CASE(VHR-390EV ONLY)
	613 144 5802	CUSHION,FRONT
	613 144 5819	CUSHION,BACK
	613 139 8047	POLYE COVER,INNER-K

****

LOCATION	PARTS NO.	DESCRIPTION
CABINET & CHASSIS PARTS		
CH-1	411 137 0007	SCR L-TPG BIN 3X10
CH-2	411 021 7907	SCR S-TPG BIN 4X12
CH-3	613 145 6594	COMPL PWB,VP-1
CH-4	613 134 4730	COMPL PCB,TM-8
CH-5	412 028 9406	SPECIAL SCREW
CH-6	613 140 7015	COVER TOP
CH-7	613 143 8644	MODULATOR,RF
OR	613 143 8651	MODULATOR,RF
CH-8	613 145 7850	TERMINAL,21PIN
CH-9	411 021 3800	SCR S-TPG BIN 3X10
CH-10	613 145 7867	TERMINAL RCA
CH-11	613 147 5410	COMPL PWB,CP-1-A(VHR-390G ONLY)
OR	613 149 4695	COMPL PWB,CP-1-A(VHR-390EV ONLY)
CH-12	613 095 4824	TUNER PACK(VHR-390G ONLY)
OR	613 107 9403	TUNER PACK(VHR-390EV ONLY)
CH-13	645 000 1826	TUNER,IF(VHR-390G ONLY)
OR	645 000 1734	TUNER,IF(VHR-390EV ONLY)
CH-15	613 147 3867	COMPL PWB,TB-1(VHR-390G ONLY)
OR	613 145 6600	COMPL PWB,TB-1(VHR-390EV ONLY)
CH-16	613 145 0707	STAND,BACK
CH-17	613 139 2182	COVER BOTTOM
CH-19	613 121 1001	STAND,FELT,FRONT
CH-20	613 144 4461	COMPL PWB,TM-1
CH-21	613 147 5328	DOOR CASSETTE
CH-22	613 140 7459	SPRING
CH-23	613 145 6624	ASSY,CABINET FRONT
CH-24	613 141 1395	PLUG,26P(CN301,302-CN711,712)
CH-25	613 147 5663	COMPL PWB,PW-1(VHR-390G ONLY)
OR	613 146 8290	COMPL PWB,PW-1(VHR-390EV ONLY)
CH-26	411 021 6405	SCR S-TPG BIN 3X8

Undesignated numeral shows
Location No.:CH-
N.S.P.:Not available as service parts



MECHANISM PARTS

MECHANISM PARTS 1

LOCATION	PARTS NO.	DESCRIPTION
DR-1	613 097 5355	COMPL,CYLINDER,4H6P-R
DR-2	411 038 1608	SCR PAN+W 3X8
DR-3	613 097 5362	ASSY,CYLINDER,UPR 4H6P-R
DR-4	613 095 9881	ASSY,CYLINDER,LWR 6K
DR-5	613 097 2170	SPACER,MOTOR 0.3T
DR-6	613 088 9072	BASE,CYLINDER
DR-7	411 047 7509	SCR PAN+FLG 3X6
DR-8	411 047 5000	SCR PAN+FLG 2.6X8
DR-9	613 132 3520	STATOR,MOTOR CYL
OR	613 085 7279	STATOR,MOTOR CYL
DR-10	411 044 8301	SCR PAN+SW 2.3X10
OR	411 044 9209	SCR PAN+SW 2.3X8
DR-11	613 022 4019	ROTOR,MOTOR CYL
DR-12	411 044 9001	SCR PAN+SW 2.3X6
MB-1	613 123 4802	SLEEVE
MB-2	613 053 3227	SPECIAL WASHER
MB-3	613 123 4970	TAPE GUIDE
MB-4	411 004 5302	NUT HEX (3)
MB-5	613 123 9418	CAP
MB-6	613 021 9961	ASSY,SLIDE,ACT PINCH
MB-7	613 021 9800	ASSY,LEVER,CAM PINCH
MB-8	411 109 2008	WASHER Y 3.1X8X0.5
MB-9	613 022 1797	SPRING,ACE HEAD
MB-10	613 021 9640	COMPL,BRACKET,HEAD
MB-11	613 110 1692	SLEEVE,ACE HEAD
MB-12	412 015 8207	SPECIAL NUT (M5)
MB-13	411 120 0007	SCR PAN+SW+W 2.6X5
MB-14	613 120 3631	BRACKET,STOPPER
MB-15	613 022 1582	SPRING,SLIDE BRAKE
MB-16	613 094 9240	COMPL,SLIDE,CAM
MB-17	613 022 1575	SPRING,LINK LOCK
MB-18	613 022 2725	DAMPER
MB-19	613 022 2534	GEAR,FRONT LOAD
MB-20	613 094 1206	ASSY,LEVER,FRONT
MB-21	613 134 2910	GEAR,HELICAL FRONT
MB-22	411 046 8002	SCR PAN+SW+W 2.6X6
MB-23	411 023 2801	SCR S-TPG PAN 2.6X6
MB-24	411 023 3303	SCR S-TPG PAN 2.6X8
OR	411 021 3107	SCR S-TPG BIN 2.6X8
MB-28	613 077 3227	HOLDER,WORM
MB-29	613 027 0382	WASHER
MB-30	613 078 8320	ASSY,WORM,FRONT
MB-31	613 117 0599	BRACKET,HOLDER
MB-32	613 093 9159	PLATE,NUT
MB-33	613 093 8374	DAMPER,MOTOR
MB-34	613 077 3616	DAMPER,WORM
MB-35	613 121 9960	ASSY,LOADING MOTOR
MB-36	613 092 9945	DAMPER,MOTOR
MB-37	613 132 8075	COMPL PCB,MC-3
MB-38	613 144 0678	COMPL PWB,MC-2
MB-39	613 110 0374	ROTARY SWITCH
MB-40	411 126 5303	SCR PAN 2.6X13
MB-41	613 092 9921	ASSY,SLIDE,FRONT
MB-42	613 092 5985	SPRING,LEVER LOAD
MB-43	613 092 5992	SPRING,LEVER ACT
MB-44	613 092 5886	HOLDER,WORM
OR	613 138 8628	HOLDER,WORM
MB-45	613 027 0627	WASHER 2.1X6X0.5
MB-46	613 092 9938	ASSY,WORM,LOAD
MB-47	613 022 2985	BELT,LOADING
MB-48	412 033 4106	WASHER SLIT 2.6X5X0.50
MB-49	613 077 3579	GEAR,HELICAL
MB-50	613 102 9293	ASSY,LEVER,REV GUIDE
MB-51	613 022 1568	SPRING,REVIEW LEVER
MB-52	613 022 0158	COMPL,PINCH ROLLER
MB-53	613 147 9951	SPRING,PINCH ROLLER
MB-54	411 109 2107	WASHER Y 3.6X6X0.5
MB-55	613 078 8160	COMPL,LEVER,ACT BRAKE
MB-57	613 135 7655	PLATE,BGR
MB-58	613 145 5009	ASSY,MOUNTING,ROLLER S
MB-59	613 145 5016	ASSY,MOUNTING,ROLLER T
MB-60	411 063 0904	SCR SET HEX-SCT 2X3
MB-61	613 022 0233	ASSY,GUIDE,ROLLER
MB-63	645 000 2533	HEAD,FULL ERASE
MB-66	613 136 0532	LEVER,FE HEAD
MB-67	613 022 1698	SPRING,ERASE HEAD
MB-80	411 109 1803	WASHER Y 2.6X6X0.5
MB-81	613 119 8562	ASSY,ROLLER,CLEANER
MB-82	613 143 1881	ASSY,LEVER,CLEANER
MB-83	613 119 8593	SPRING
MB-84	613 142 9055	BRACKET,CLEANER
MB-90	613 140 4069	FLEXIBLE FLAT CABLE,CN811-CN303

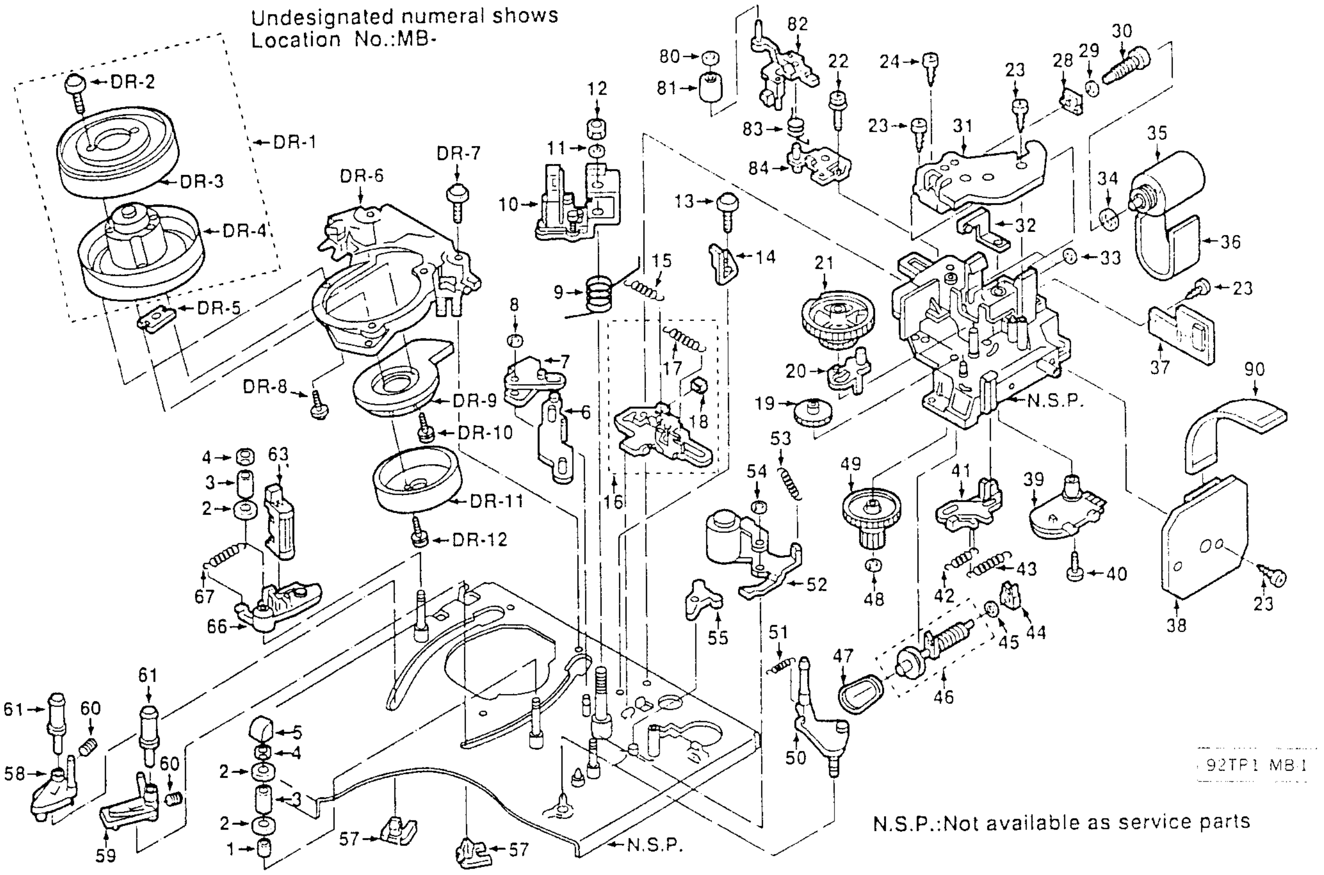
****

MECHANISM PARTS 2

LOCATION	PARTS NO.	DESCRIPTION
MC-1	645 000 5053	MOTOR,CAPSTAN DC 3W
MC-2	613 022 2978	BELT,REEL DRIVE
MC-3	613 135 4609	COMPL,LEVER,CLUTCH
MC-6	613 022 1520	SPRING,LEVER CLUTCH
MC-7	613 082 3434	LEVER,CHANGE CLUTCH
MC-8	613 022 1711	SPRING,CHANGE CLUTCH
MC-9	613 081 7518	ASSY,BRAKE CAPSTAN
MC-10	613 098 2285	SPRING,CAPSTAN
MC-12	411 021 3107	SCR S-TPG BIN 2.6X8
MC-13	411 109 2008	WASHER Y 3.1X8X0.5
MC-14	613 142 9093	SLIDE,CAM PLATE
MC-15	613 022 2701	CAM,MODE
MC-16	411 109 1902	WASHER Y 3.1X6X0.5
MC-17	613 135 7686	CAM,MAIN
MC-18	613 135 7532	ASSY,RACK,LOAD
MC-19	411 109 1803	WASHER Y 2.6X6X0.5
MC-20	613 135 7648	SPACER,RACK LOAD
MC-22	411 047 6809	SCR PAN+FLG 3X4
MC-23	613 021 9763	ASSY,EARTH,CYL
MC-24	613 135 7662	GEAR,LOAD TAKE UP
MC-25	613 022 1551	SPRING,GEAR LOAD T
MC-26	613 021 9879	ASSY,LEVER,LOAD T
MC-27	613 090 6373	GEAR,LOAD S
MC-28	613 022 1704	SPRING,GEAR LOAD S
MC-29	613 021 9862	ASSY,LEVER,LOAD S
MC-30	613 022 2039	LEVER,RETURN TENSION
MC-31	613 091 3104	ASSY,LEVER CONTROL
MC-34	411 028 6309	SCR S-TPG PAN 2.6X6
MC-35	412 015 8603	SPECIAL WASHER 3.1X6X0.25
MC-36	613 130 9890	ASSY,GEAR,FRICTION
MC-37	412 045 4606	SPECIAL WASHER 2.4X6X0.25
MC-38	411 092 0906	WASHER Z 2.6X10X0.5
MC-40	411 100 0300	SCR S-TPG BIN 2.6X5
MC-41	613 120 9060	COMPL,MC-1

MECHANISM PARTS 1

Undesignated numeral shows
Location No.:MB-


DR-1
DR-2
DR-3
DR-4
DR-5
DR-6
DR-7
DR-8
DR-9
DR-10
DR-11
DR-12
1
2
3
4
5
6
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8
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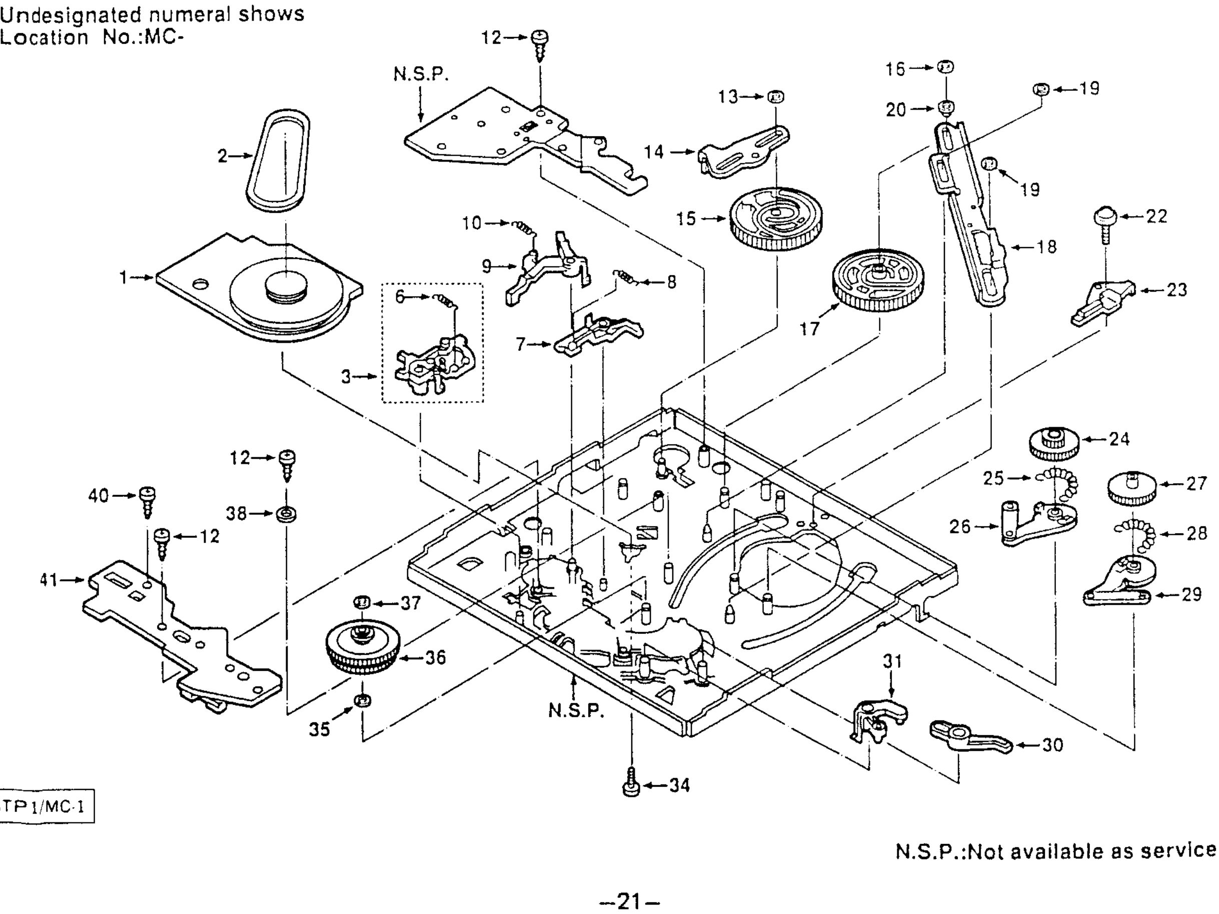
N.S.P.
92TP1 MB1

N.S.P.:Not available as service parts

MECHANISM PARTS 2

Undesignated numeral shows
Location No.:MC-


N.S.P.
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20
22
23
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31
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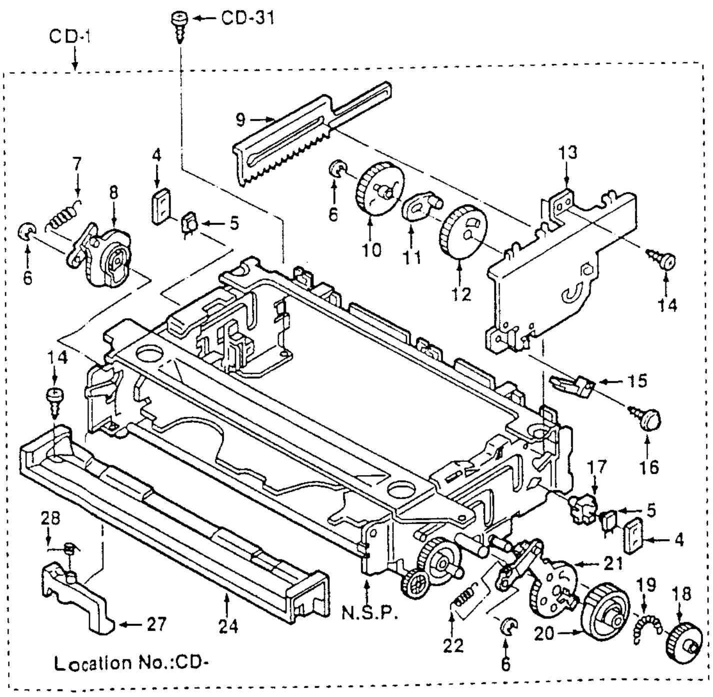
38
40
41
93TP1/MC-1

N.S.P.:Not available as service parts

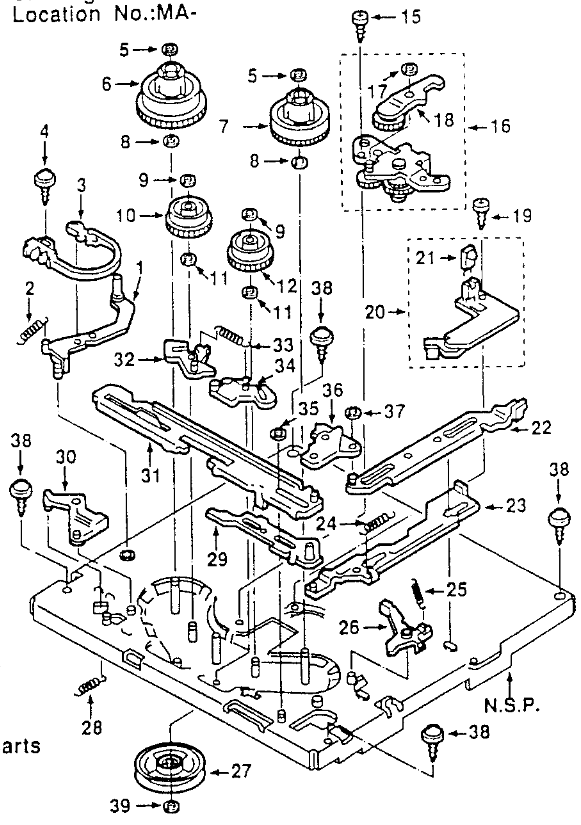
CB602700
MB0008##

MECHANISM PARTS 3

LOCATION	PARTS NO.	DESCRIPTION
CD-1	613 142 9581	COMPL.CASSETTE MECHANISM
CD-4	613 022 0585	LID
CD-5	407 098 3201	PHOTO COUPLE PN150SAN
CD-6	411 015 9801	RING E 2.3
CD-7	613 022 1643	SPRING.LINK L
CD-8	613 022 0073	ASSY.GEAR.LEVER L
CD-9	613 022 2695	RACK
CD-10	613 141 6109	GEAR.LOCK
CD-11	613 021 9916	ASSY.LEVER.PINION
CD-12	613 022 2626	GEAR.PINION
CD-13	613 021 9657	ASSY.BRACKET.GEAR
CD-14	411 027 1305	SCR S-TPG BIN 2.6X4
CD-15	613 095 0949	SW.SPECIAL
CD-16	411 106 9208	SCR PAN+SW+W 2X9
CD-17	613 022 0943	HOLDER.TRANSISTOR
CD-18	613 022 2619	GEAR.IDLER
CD-19	613 022 1667	SPRING.GEAR MAIN
CD-20	613 022 2596	GEAR.MAIN
CD-21	613 022 0097	ASSY.GEAR.LEVER R
CD-22	613 022 1674	SPRING.LINK R
CD-24	613 022 4064	BOARD.UNDER
CD-27	613 124 5006	LEVER.SAFETY SW
CD-28	613 125 6149	SPRING.SAFETY SW
CD-31	411 001 8702	SCR BIN 3X6
MA-1	613 100 0391	ASSY.LEVER.TENSION
MA-2	613 085 7996	SPRING.LEVER TENSION
MA-3	613 021 9701	ASSY.HOLDER.BAND
MA-4	411 144 2803	SCR PAN+SW+W 2.6X6
MA-5	411 109 1605	WASHER Y 2.6X6X0.25
MA-6	613 135 7068	ASSY.REEL.SUPPLY
OR	613 135 7549	ASSY.REEL.SUPPLY
MA-7	613 135 7075	ASSY.REEL.TAKE UP
OR	613 143 2963	ASSY.REEL.TAKE UP
MA-8	412 021 5306	SPECIAL WASHER 3.1X6X0.3
OR	412 015 8900	SPECIAL WASHER 3.1X6X0.4
OR	412 015 8504	SPECIAL WASHER 3.1X6X0.5
MA-9	411 109 1506	WASHER Y 2.1X6X0.25
OR	411 109 1407	WASHER Y 2.1X5X0.25
MA-10	613 135 7150	GEAR.REEL SUPPLY
OR	613 142 9116	GEAR.REEL SUPPLY
MA-11	412 026 7305	SPECIAL WASHER 2.6X6X0.25
MA-12	613 135 7167	GEAR.REEL TAKE UP
OR	613 142 9109	GEAR.REEL TAKE UP
MA-15	412 042 4302	SPECIAL SCREW 2.6X4
MA-16	613 135 7099	COMPL.IDLER.CLUTCH
MA-17	411 120 1301	WASHER Y 2.1X4X0.25
MA-18	613 135 7082	ASSY.IDLER
MA-19	411 021 3107	SCR S-TPG BIN 2.6X8
MA-20	613 120 9053	COMPL PCB.MC-4
MA-21	407 016 7205	LED LN59
MA-22	613 021 9985	ASSY.SLIDE.ACT PLATE
MA-23	613 142 9086	SLIDE.C BRAKE
MA-24	613 022 1612	SPRING.RETURN SLIDE
MA-25	613 022 1506	SPRING.SUB T
MA-26	613 098 0106	ASSY.BRAKE SUB T
MA-27	613 077 3647	PULLEY.REEL
MA-28	613 022 1490	SPRING.SUB SUPPLY
MA-29	613 022 2374	SLIDE.ACT BRAKE
MA-30	613 084 8871	BRAKE.SUB SUPPLY
MA-31	613 022 0004	ASSY.SLIDE.M PLATE
MA-32	613 080 9216	ASSY.BRAKE.SUPPLY
MA-33	613 086 2914	SPRING.MAIN BRAKE
MA-34	613 080 9209	ASSY.BRAKE.TAKE UP
MA-35	411 109 3005	WASHER Y 2.6X5X0.5
MA-36	613 022 2015	LEVER.CONT PLATE
MA-37	412 015 9501	SPECIAL WASHER
MA-38	411 021 7907	SCR S-TPG BIN 4X12
MA-39	412 045 4606	SPECIAL WASHER 2.4X6X0.25



Undesignated numeral shows
Location No.:MA-



N.S.P.:Not available as service parts

92EP1/MA-1

ELECTRICAL PARTS

NOTE;

1. Materials of Capacitors and Resistors are abbreviated as follows;

Resistors

MT-FILM	Metallized Film Resistor
MT-GLAZE	Metallized Glaze Resistor
OXIDE-MT	Oxide Metallized Film Resistor

Capacitors

MT-POLYEST	Metallized Polyester Capacitor
MT-COMPO	Metallized Composite Capacitor
TA-SOLID	Tantalum Solid Capacitor
AL-SOLID	Aluminum Solid Capacitor
NP-ELECT	Non-Polarized Electrolytic Capacitor
OS-SOLID	Aluminum Solid Capacitors with Organic Semiconductive Electrolytic Capacitor
DL-ELECT	Double Layered Electrolytic Capacitor

2. Tolerance of Capacitor(10pF over) and Resistor are noted with follow symboles.

F ············ ±1%　G ············ ±2%　J ············ ±5%　K ············ ±10%
M ············ ±20%　N ············ ±30%　Z ············ +80% ~ −20%

3. Capacitors

U : uF　P : pF

4. Inductors

UH : uH　MH : mH

5. N.S.P. : Not available as service parts.

LOCATION	PARTS NO.	DESCRIPTION
COMPL PWB,CP-1-A		
COMPL.NO	613 147 5410	(VHR-390G)
COMPL.NO	613 149 4695	(VHR-390EV)
(SEMICONDUCTORS)		
Q1002	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1003	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q1004	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q1006	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1007	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1010	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q1011	405 063 9708	TR DTC144EL-TL2
OR	405 123 6500	TR UN6213-(TA)
Q1012	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1014	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1101	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q1102	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
Q1102	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1151	405 063 9906	TR DTC124EL-TL2
OR	405 123 6401	TR UN6212-(TA)
Q1152	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q1301	405 063 9104	TR DTA144EL-TL2
OR	405 123 6609	TR UN6113-(TA)
Q1312	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1313	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
Q1601	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q1621	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1622	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q1623	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
Q2001	405 018 0101	TR 2SC3331-T-AA
OR	405 018 0200	TR 2SC3331-U-AA
Q2002	405 000 1208	TR DTA124ES-DCTP
OR	405 003 7702	TR 2SA1346-AC
Q2003	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2
OR	405 000 6104	TR DTC144ES-DCTP
Q2004	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2
OR	405 000 6104	TR DTC144ES-DCTP
Q2008	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2

LOCATION	PARTS NO.	DESCRIPTION
Q2008	405 000 6104	TR DTC144ES-DCTP
Q2009	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2
OR	405 000 6104	TR DTC144ES-DCTP
Q2306	405 013 6801	TR 2SC2274-E-AA
OR	405 013 7006	TR 2SC2274-F-AA
Q2308	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2
OR	405 000 6104	TR DTC144ES-DCTP
Q2309	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2
OR	405 000 6104	TR DTC144ES-DCTP
Q2314	405 003 7603	TR 2SA1345-AC
OR	405 063 9104	TR DTA144EL-TL2
OR	405 000 2205	TR DTA144ES-DCTP
Q2315	405 018 2501	TR 2SC3399-AC
OR	405 063 9708	TR DTC144EL-TL2
OR	405 000 6104	TR DTC144ES-DCTP
Q2401	405 003 7900	TR 2SA1348-AC
OR	405 000 0508	TR DTA114ES-DCTP
Q2402	405 018 2808	TR 2SC3402-AC
OR	405 000 3103	TR DTC114ES-DCTP
Q2403	405 089 2103	TR 2SC4483-S-AN
OR	405 107 4102	TR 2SD1994-R (TA)
OR	405 107 4201	TR 2SD1994-S (TA)
Q2404	405 013 6801	TR 2SC2274-E-AA
OR	405 013 7006	TR 2SC2274-F-AA
Q3001	405 063 9708	TR DTC144EL-TL2
OR	405 123 6500	TR UN6213-(TA)
Q3002	405 063 9708	TR DTC144EL-TL2
OR	405 123 6500	TR UN6213-(TA)
Q3503	405 063 9708	TR DTC144EL-TL2
OR	405 123 6500	TR UN6213-(TA)
Q3504	405 063 9708	TR DTC144EL-TL2
OR	405 123 6500	TR UN6213-(TA)
Q3551	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q3552	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q3553	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q6001	405 026 9004	TR 2SK222-D-AA(VHR-390G ONLY)
OR	405 026 9103	TR 2SK222-E-AA(VHR-390G ONLY)
OR	405 114 7806	TR 2SK1104-(TA) P(VHR-390G ONLY)
OR	405 114 7905	TR 2SK1104-(TA) Q(VHR-390G ONLY)
OR	405 114 8001	TR 2SK1104-(TA) R(VHR-390G ONLY)
OR	405 073 6407	TR 2SK772-E-AC(VHR-390G ONLY)
OR	405 073 6506	TR 2SK772-F-AC(VHR-390G ONLY)
Q6004	405 018 2501	TR 2SC3399-AC(VHR-390G ONLY)
OR	405 000 6104	TR DTC144ES-DCTP(VHR-390G ONLY)
Q6611	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
Q6621	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R

LOCATION	PARTS NO.	DESCRIPTION
Q6901	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
Q6902	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
Q6903	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 093 0607	TR KSC2785-Y
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
Q6904	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
Q6921	405 084 8209	TR 2SC2960-F-SPA-AC(VHR-390G ONLY)
OR	405 084 8308	TR 2SC2960-G-SPA-AC(VHR-390G ONLY)
(INTEGRATED CIRCUITS)		
IC101	409 303 6700	IC LA7345M
IC111	409 297 6205	IC LC89925
IC162	410 166 2808	IC LC74760M-8783
IC201	409 189 3404	IC BA7755A
IC231	409 301 3602	IC AN3961NFBP-A
IC301	410 178 8300	IC LC866648V-5420
IC302	409 243 4101	IC MN1380-L
OR	409 313 0903	IC MN1381-L(TA)
IC303	409 114 4803	IC LB1641
IC351	409 306 0408	IC XRU2890BK
OR	409 306 0507	IC BU2890BK
OR	409 311 9601	IC BU2890DK
IC601	409 026 8203	IC L5631(VHR-390G ONLY)
OR	409 057 5103	IC UPC574J(VHR-390G ONLY)
IC602	409 283 6905	IC LE24C04S1
OR	410 172 6906	IC X24C04P-C7346
IC631	409 297 9206	IC TDA8417
IC632	409 056 6903	IC UPC1391HAMS
IC691	409 019 6209	IC LA7910(VHR-390G ONLY)
(DIODES)		
D1003	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1004	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1007	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1301	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1601	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1602	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1621	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D1622	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D2001	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D2301	407 053 6803	ZENER DIODE MTZ5.6C-T-77
D2401	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D2402	407 063 8705	ZENER DIODE MTZJ5.1C-T-77

LOCATION	PARTS NO.	DESCRIPTION
D2403	407 120 5807	DIODE AK04-V2
OR	407 160 9100	DIODE ERA83-004V5
D2405	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D2406	407 063 8705	ZENER DIODE MTZJ5.1C-T-77
D3001	407 150 7703	DIODE RB441Q T-77
D3002	407 063 9504	ZENER DIODE MTZJ8.2B-T-77
OR	407 070 8101	ZENER DIODE GZS8.2Y-BT
D3003	407 099 5303	ZENER DIODE MTZJ5.6B-T-77
OR	407 051 6904	ZENER DIODE GZS5.6Y-BT
D3101	407 012 4406	DIODE 1SS133-T-77(VHR-390EV ONLY)
OR	407 007 9904	DIODE GMA01-BT(VHR-390EV ONLY)
D3104	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3105	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3106	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3107	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3111	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3113	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3121	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3122	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3123	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3502	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3554	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D6001	407 078 1104	ZENER DIODE MTZ33A-T-77 (VHR-390EV ONLY)
OR	407 078 1203	ZENER DIODE MTZ33B-T-77 (VHR-390EV ONLY)
D6901	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D6902	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D6903	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
(CRYSTAL DEVICES)		
X1001	645 000 6012	OSC,CRYSTAL 4.433619MHZ
OR	645 000 6029	OSC,CRYSTAL 4.433619MHZ
OR	645 002 4436	OSC,CRYSTAL 4.433619MHZ
X1621	613 002 8709	CRYSTAL 17.734475MHZ
OR	613 127 1555	OSC,CRYSTAL 17.734475MHZ
X3001	613 132 8242	RESONATOR,CERAMIC13.92MHZ
X3002	613 109 0972	OSC,CRYSTAL 32KHZ
OR	613 123 6387	OSC,CRYSTAL 32.768KHZ
X6301	645 002 0711	OSC,CRYSTAL 10MHZ
(CERAMIC RESONATORS)		
XF631	613 092 4797	FILTER 5.74MHZ
XF632	613 119 3925	FILTER,5.74MHZ B.P
(VARIABLE RESISTORS)		
VR101	613 120 8438	VR,SEMI 22KB
OR	613 120 8582	VR,SEMI 22KB
VR102	613 120 8421	VR,SEMI 2.2KB
VR102	613 120 8575	VR,SEMI 2.2KB
VR103	613 147 7216	VR,SEMI 6.8KB
OR	613 147 7223	VR,SEMI 6.8KB
VR104	613 079 2532	VR,SEMI 10KB
OR	613 120 8544	VR,SEMI 10KB
VR201	613 097 7915	VR,SEMI 100KB
OR	613 001 9097	SEMI VR 100KB
VR233	645 002 7703	VR,SEMI 10KS
VR234	645 002 7710	VR,SEMI 5KS
VR351	613 097 7953	VR,SEMI 220KB
OR	613 001 9110	SEMI VR 220KB
VR631	613 105 3823	VR,SEMI 6.8KB
OR	613 001 9028	SEMI VR 6.8KB
(TRIMMER)		
CT120	613 002 6378	TRIMMER
(INDUCTORS)		
L1001	613 014 1156	COIL,INDUCTOR 39UHJ
OR	613 014 4676	HF CHOKE 39UHJ
L1002	613 014 0739	COIL,INDUCTOR 1.0UHM
OR	613 014 4256	HF CHOKE 1.0UHK
L1004	613 014 0999	COIL,INDUCTOR 150UHK
OR	613 014 4515	HF CHOKE 150UHK
L1005	613 014 1019	COIL,INDUCTOR 220UHK
OR	613 014 4539	HF CHOKE 220UHK
L1007	613 014 0791	COIL,INDUCTOR 3.3UHK
OR	613 014 4317	HF CHOKE 3.3UHK
L1008	613 014 0876	COIL,INDUCTOR 15UHK
OR	613 014 4393	HF CHOKE 15UHK
L1009	613 014 0777	COIL,INDUCTOR 2.2UHM
OR	613 014 4294	HF CHOKE 2.2UHK
L1010	613 014 0906	COIL,INDUCTOR 27UHK
OR	613 014 4423	HF CHOKE 27UHK
L1012	613 014 1156	COIL,INDUCTOR 39UHJ
OR	613 014 4676	HF CHOKE 39UHJ
L1013	613 014 0913	COIL,INDUCTOR 33UHK
OR	613 014 4430	HF CHOKE 33UHK
L1081	613 014 0975	COIL,INDUCTOR 100UHK
OR	613 014 4492	HF CHOKE 100UHK
L1101	613 014 0968	COIL,INDUCTOR 82UHK
OR	613 014 4485	HF CHOKE 82UHK
L1622	613 014 0821	COIL,INDUCTOR 5.6UHK
OR	613 014 4348	HF CHOKE 5.6UHK
L2001	613 015 6297	COIL,INDUCTOR 560UHJ
L2002	613 015 5474	HF CHOKE 27MH
L2003	613 014 3532	HF CHOKE 10000UHJ
L2301	613 015 6365	COIL,INDUCTOR 2.2MHJ
OR	613 014 8414	HF CHOKE 2200UHJ
L3001	645 002 3675	LINE FILTER
L3002	645 002 3675	LINE FILTER
L6002	613 014 0852	COIL,INDUCTOR 10UHK(VHR-390G ONLY)
OR	613 014 4379	HF CHOKE 10UHK(VHR-390G ONLY)
L6003	613 014 0852	COIL,INDUCTOR 10UHK(VHR-390G ONLY)
OR	613 014 4379	HF CHOKE 10UHK(VHR-390G ONLY)
L6004	613 014 0852	COIL,INDUCTOR 10UHK(VHR-390G ONLY)
OR	613 014 4379	HF CHOKE 10UHK(VHR-390G ONLY)
L6005	613 014 0852	COIL,INDUCTOR 10UHK(VHR-390G ONLY)
OR	613 014 4379	HF CHOKE 10UHK(VHR-390G ONLY)
L6601	613 014 0876	COIL,INDUCTOR 15UHK
OR	613 014 4393	HF CHOKE 15UHK
L6602	613 014 0852	COIL,INDUCTOR 10UHK
OR	613 014 4379	HF CHOKE 10UHK

LOCATION	PARTS NO.	DESCRIPTION		
L6621	613 014 0975	COIL,INDUCTOR 100UHK		
OR	613 014 4492	HF CHOKE 100UHK		
(TRANSFORMERS)				
T2001	621 019 9596	70KHZ OSC TRANS		
T6901	613 109 0958	TRANS,IF		
OR	613 109 0965	TRANS,IF		
(DELAY LINES)				
DL101	645 000 5992	DELAY LINE(COMB)		
OR	645 000 6005	DELAY LINE(COMB)		
(CAPACITORS)				
C1002	403 070 7205	CERAMIC	150P J	50V
C1003	403 075 3103	CERAMIC	82P J	50V
C1004	403 022 7703	CERAMIC	33P J	50V
C1005	403 139 2608	ELECT	0.47U M	50V
C1006	403 025 7304	CERAMIC	4.7P K	50V
C1007	403 073 2702	CERAMIC	390P J	50V
C1008	403 017 9705	CERAMIC	22P J	50V
C1009	403 025 7304	CERAMIC	4.7P K	50V
C1010	403 075 3103	CERAMIC	82P J	50V
C1011	403 139 2707	ELECT	1U M	50V
C1012	403 139 1502	ELECT	10U M	16V
C1013	403 139 2608	ELECT	0.47U M	50V
C1014	403 001 1906	CERAMIC	0.01U M	16V
C1015	403 228 6401	CERAMIC	0.033U Z	16V
C1016	403 120 9005	CERAMIC	0.022U J	16V
C1021	403 073 2702	CERAMIC	390P J	50V
C1022	403 217 5507	CERAMIC	0.1U J	16V
C1023	403 070 7205	CERAMIC	150P J	50V
C1028	403 121 9509	CERAMIC	0.1U Z	50V
C1030	403 139 2707	ELECT	1U M	50V
C1031	403 139 2707	ELECT	1U M	50V
C1032	403 120 9609	CERAMIC	0.047U J	16V
C1033	403 120 9005	CERAMIC	0.022U J	16V
C1034	403 075 2601	CERAMIC	75P J	50V
C1036	403 139 2707	ELECT	1U M	50V
C1037	403 139 2905	ELECT	2.2U M	50V
C1038	403 120 9005	CERAMIC	0.022U J	16V
C1039	403 120 9609	CERAMIC	0.047U J	16V
C1040	403 001 1906	CERAMIC	0.01U M	16V
C1041	403 139 1502	ELECT	10U M	16V
C1042	403 120 9609	CERAMIC	0.047U J	16V
C1044	403 139 1007	ELECT	47U M	6.3V
C1045	403 001 1906	CERAMIC	0.01U M	16V
C1046	403 139 1502	ELECT	10U M	16V
C1047	403 139 1502	ELECT	10U M	16V
C1048	403 001 1906	CERAMIC	0.01U M	16V
C1049	403 022 7703	CERAMIC	33P J	50V
C1050	403 001 1906	CERAMIC	0.01U M	16V
C1051	403 073 6205	CERAMIC	470P J	50V
C1052	403 115 0901	CERAMIC	560P J	50V
C1053	403 001 1906	CERAMIC	0.01U M	16V
C1054	403 139 1007	ELECT	47U M	6.3V
C1058	403 019 9703	CERAMIC	27P J	50V
C1060	403 022 7703	CERAMIC	33P J	50V
C1061	403 022 7703	CERAMIC	33P J	50V
C1062	403 071 1509	CERAMIC	180P J	50V
C1063	403 068 8801	CERAMIC	100P J	50V
C1064	403 001 1906	CERAMIC	0.01U M	16V
C1081	403 074 8703	CERAMIC	680P J	50V
C1101	403 139 1007	ELECT	47U M	6.3V
C1102	403 001 1906	CERAMIC	0.01U M	16V
C1104	403 030 6309	CERAMIC	68P J	50V
C1105	403 026 2209	CERAMIC	47P J	50V
C1106	403 025 7304	CERAMIC	4.7P K	50V
C1107	403 026 2209	CERAMIC	47P J	50V

LOCATION	PARTS NO.	DESCRIPTION		
C1109	403 001 1906	CERAMIC	0.01U M	16V
C1110	403 139 2707	ELECT	1U M	50V
C1311	403 120 9005	CERAMIC	0.022U J	16V
C1601	403 121 9509	CERAMIC	0.1U Z	50V
C1602	403 223 9308	ELECT	470U M	6.3V
C1621	403 012 6006	CERAMIC	15P J	50V
C1622	403 012 6006	CERAMIC	15P J	50V
C1623	403 163 7907	ELECT	47U M	6.3V
C1624	403 139 1403	ELECT	47U M	10V
C1625	403 139 2806	ELECT	10U M	50V
C1627	403 068 8801	CERAMIC	100P J	50V
C1628	403 139 2806	ELECT	10U M	50V
C1630	403 217 4401	CERAMIC	6800P J	16V
C1631	403 086 2805	NP-ELECT	1U M	50V
C1632	403 120 9005	CERAMIC	0.022U J	16V
C1633	403 019 0403	CERAMIC	24P J	50V
C1634	403 008 5105	CERAMIC	10P D	50V
C1635	403 121 9509	CERAMIC	0.1U Z	50V
C1636	403 001 1906	CERAMIC	0.01U M	16V
C1637	403 163 7907	ELECT	47U M	6.3V
C2001	403 193 8400	ELECT	0.22U M	50V
C2002	403 129 0409	CERAMIC	0.01U K	16V
C2003	403 193 3900	ELECT	33U M	6.3V
C2004	403 001 5102	CERAMIC	2200P M	16V
C2005	403 193 6703	ELECT	1U M	50V
C2006	403 120 8206	CERAMIC	0.012U K	16V
C2007	403 189 2405	ELECT	10U M	16V
C2009	403 071 5408	CERAMIC	220P J	50V
C2010	403 001 6208	CERAMIC	2700P M	16V
C2019	403 163 8409	ELECT	47U M	16V
C2021	403 001 1906	CERAMIC	0.01U M	16V
C2022	403 001 1906	CERAMIC	0.01U M	16V
C2023	403 071 6207	CERAMIC	220P K	50V
C2024	403 082 4209	POLYPRO	6800P J	100V
C2025	403 213 1107	CERAMIC	8200P K	16V
C2027	403 138 2500	CERAMIC	0.022U K	16V
C2030	403 189 2405	ELECT	10U M	16V
C2301	403 189 2405	ELECT	10U M	16V
C2302	403 189 2405	ELECT	10U M	16V
C2303	403 189 2405	ELECT	10U M	16V
C2304	403 189 2405	ELECT	10U M	16V
C2305	403 189 2405	ELECT	10U M	16V
C2306	403 189 2405	ELECT	10U M	16V
C2307	403 189 2405	ELECT	10U M	16V
C2308	403 189 2405	ELECT	10U M	16V
C2310	403 167 6500	ELECT	33U M	6.3V
C2311	403 167 6500	ELECT	33U M	6.3V
C2312	403 167 6500	ELECT	33U M	6.3V
C2313	403 001 7908	CERAMIC	0.047U K	16V
C2314	403 001 7908	CERAMIC	0.047U K	16V
C2315	403 191 8808	ELECT	2.2U M	50V
C2316	403 191 8808	ELECT	2.2U M	50V
C2317	403 159 8109	ELECT	100U M	6.3V
C2318	403 159 8109	ELECT	100U M	6.3V
C2319	403 129 9709	CERAMIC	0.015U K	16V
C2320	403 129 9709	CERAMIC	0.015U K	16V
C2321	403 129 0300	CERAMIC	0.01U J	16V
C2322	403 129 0300	CERAMIC	0.01U J	16V
C2323	403 001 1609	CERAMIC	0.01U K	16V
C2324	403 001 1609	CERAMIC	0.01U K	16V
C2325	403 001 1906	CERAMIC	0.01U M	16V
C2326	403 001 1906	CERAMIC	0.01U M	16V
C2327	403 163 7907	ELECT	47U M	6.3V
C2328	403 163 7907	ELECT	47U M	6.3V
C2329	403 001 1906	CERAMIC	0.01U M	16V
C2330	403 001 1906	CERAMIC	0.01U M	16V
C2331	403 189 2405	ELECT	10U M	16V
C2332	403 189 2405	ELECT	10U M	16V

LOCATION	PARTS NO.	DESCRIPTION
C2333	403 189 2405	ELECT 10U M 16V
C2334	403 163 8409	ELECT 47U M 16V
C2344	403 184 9805	MT-POLYEST 0.22U J 50V
C2345	403 072 4202	CERAMIC 270P J 50V
C2346	403 217 4005	CERAMIC 2200P J 16V
C2350	403 001 1906	CERAMIC 0.01U M 16V
C2352	403 189 2405	ELECT 10U M 16V
C2353	403 193 7502	ELECT 22U M 6.3V
C2354	403 191 8709	ELECT 1U M 50V
C2361	403 163 7907	ELECT 47U M 6.3V
C2362	403 001 1906	CERAMIC 0.01U M 16V
C2371	403 001 1906	CERAMIC 0.01U M 16V
C2372	403 001 1906	CERAMIC 0.01U M 16V
C2401	403 001 1906	CERAMIC 0.01U M 16V
C2402	403 163 7907	ELECT 47U M 6.3V
C2403	403 001 1906	CERAMIC 0.01U M 16V
C3001	403 248 2803	ELECT 2.2U M 50V
C3002	403 001 1906	CERAMIC 0.01U M 16V
C3003	403 002 4708	CERAMIC 0.1U Z 25V
C3004	403 001 1906	CERAMIC 0.01U M 16V
C3005	403 001 1906	CERAMIC 0.01U M 16V
C3008	403 189 2405	ELECT 10U M 16V
C3009	403 001 1906	CERAMIC 0.01U M 16V
C3010	403 010 7708	CERAMIC 12P J 50V
C3011	403 017 0108	CERAMIC 20P J 50V
C3012	403 001 1906	CERAMIC 0.01U M 16V
C3013	403 001 1906	CERAMIC 0.01U M 16V
C3014	403 223 9308	ELECT 470U M 6.3V
C3015	403 009 1700	CERAMIC 10P J 50V
C3016	403 001 1906	CERAMIC 0.01U M 16V
C3017	403 072 8200	CERAMIC 330P K 50V
C3020	403 121 9509	CERAMIC 0.1U Z 50V
C3021	403 121 9509	CERAMIC 0.1U Z 50V
C3022	403 155 2804	DL-ELECT 0.047F Z 5.5V
C3050	403 001 1906	CERAMIC 0.01U M 16V
C3051	403 002 4708	CERAMIC 0.1U Z 25V
C3055	403 121 9509	CERAMIC 0.1U Z 50V
C3501	403 129 9709	CERAMIC 0.015U K 16V
C3502	403 001 8806	CERAMIC 6800P K 16V
C3503	403 129 9709	CERAMIC 0.015U K 16V
C3505	403 162 1807	ELECT 22U M 10V
C3506	403 001 8806	CERAMIC 6800P K 16V
C3508	403 162 1807	ELECT 22U M 10V
C3509	403 163 7907	ELECT 47U M 6.3V
C3510	403 001 1906	CERAMIC 0.01U M 16V
C3511	403 071 6207	CERAMIC 220P K 50V
C3513	403 119 6701	CERAMIC 0.068U K 16V
C3514	403 057 2902	POLYESTER 0.1U K 50V
C3515	403 059 6007	POLYESTER 0.022U K 50V
C3516	403 001 5003	CERAMIC 2200P K 16V
C3517	403 001 3801	CERAMIC 1500P K 16V
C3522	403 069 1207	CERAMIC 1000P K 50V
C3523	403 191 8709	ELECT 1U M 50V
C3524	403 001 1906	CERAMIC 0.01U M 16V
C3525	403 193 8608	ELECT 0.47U M 50V
C3526	403 138 2500	CERAMIC 0.022U K 16V
C3530	403 163 7907	ELECT 47U M 6.3V
C3536	403 193 7601	ELECT 220U M 6.3V
C3551	403 175 0903	MT-POLYEST 0.12U J 50V
C3552	403 028 3402	CERAMIC 56P J 50V
C3553	403 191 8709	ELECT 1U M 50V
C3554	403 070 7205	CERAMIC 150P J 50V
C3555	403 001 1906	CERAMIC 0.01U M 16V
C3556	403 069 1207	CERAMIC 1000P K 50V
C3558	403 149 0700	ELECT 33U M 16V
C3560	403 068 9402	CERAMIC 100P K 50V
C3570	403 121 9509	CERAMIC 0.1U Z 50V

LOCATION	PARTS NO.	DESCRIPTION
C3571	403 121 9509	CERAMIC 0.1U Z 50V
C3579	403 184 9201	MT-POLYEST 0.039U J 50V
C6001	403 121 9509	CERAMIC 0.1U Z 50V (VHR-390G ONLY)
C6002	403 139 2202	ELECT 4.7U M 25V (VHR-390G ONLY)
C6003	403 139 2707	ELECT 1U M 50V (VHR-390G ONLY)
C6004	403 168 6103	MT-POLYEST 0.1U J 50V (VHR-390G ONLY)
C6005	403 139 2202	ELECT 4.7U M 25V (VHR-390G ONLY)
C6006	403 139 1809	ELECT 47U M 16V
C6007	403 222 1105	CERAMIC 0.047U Z 16V (VHR-390G ONLY)
C6009	403 233 1101	ELECT 22U M 50V
C6010	403 121 9509	CERAMIC 0.1U Z 50V
C6013	403 073 7004	CERAMIC 470P K 50V
C6099	403 001 1906	CERAMIC 0.01U M 16V
C6301	403 201 3106	ELECT 100U M 16V
C6302	403 001 1906	CERAMIC 0.01U M 16V
C6303	403 139 2806	ELECT 10U M 50V
C6304	403 139 2905	ELECT 2.2U M 50V
C6305	403 139 2202	ELECT 4.7U M 25V
C6306	403 139 2202	ELECT 4.7U M 25V
C6307	403 139 2400	ELECT 0.22U M 50V
C6308	403 001 1906	CERAMIC 0.01U M 16V
C6309	403 001 1906	CERAMIC 0.01U M 16V
C6312	403 001 1906	CERAMIC 0.01U M 16V
C6313	403 033 3602	CERAMIC 82P J 50V
C6314	403 139 2806	ELECT 10U M 50V
C6601	403 248 1905	ELECT 10U M 16V
C6602	403 139 2806	ELECT 10U M 50V
C6611	403 258 2909	ELECT 22U M 10V
C6621	403 022 7703	CERAMIC 33P J 50V
C6622	403 024 1501	CERAMIC 39P J 50V
C6901	403 121 9509	CERAMIC 0.1U Z 50V
C6902	403 248 1905	ELECT 10U M 16V
C6903	403 003 3700	CERAMIC 0.022U Z 25V
C6904	403 258 3307	ELECT 0.22U M 50V
C6905	403 121 9509	CERAMIC 0.1U Z 50V
C6921	403 121 9509	CERAMIC 0.1U Z 50V (VHR-390G ONLY)
C6924	403 168 6202	MT-POLYEST 0.33U J 50V (VHR-390G ONLY)
C6925	403 184 9805	MT-POLYEST 0.22U J 50V (VHR-390G ONLY)
C6930	403 071 2001	CERAMIC 180P K 50V (VHR-390G ONLY)
(RESISTŌRS)		
R1001	401 018 3708	CARBON 3.3K JA 1/4W
R1002	401 023 1607	CARBON 820 JA 1/4W
R1003	401 019 1802	CARBON 3.9K JA 1/4W
R1004	401 012 5609	CARBON 1K JA 1/4W
R1005	401 017 0708	CARBON 270 JA 1/4W
R1006	401 023 1607	CARBON 820 JA 1/4W
R1007	401 012 5609	CARBON 1K JA 1/4W
R1008	401 017 1705	CARBON 2.7K JA 1/4W
R1009	401 022 1806	CARBON 680 JA 1/4W
R1010	401 016 3700	CARBON 2.2K JA 1/4W
R1012	401 012 5609	CARBON 1K JA 1/4W
R1013	401 012 5609	CARBON 1K JA 1/4W
R1014	401 016 3700	CARBON 2.2K JA 1/4W
R1018	401 012 5609	CARBON 1K JA 1/4W
R1019	401 016 4707	CARBON 22K JA 1/4W
R1020	401 014 5102	CARBON 15K JA 1/4W
R1021	401 013 5202	CARBON 1.2K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R1022	401 020 0702	CARBON 470 JA 1/4W
R1026	401 012 9201	CARBON 1M JA 1/4W
R1027	401 023 2703	CARBON 8.2K JA 1/4W
R1028	401 015 2605	CARBON 1.8K JA 1/4W
R1029	401 012 5609	CARBON 1K JA 1/4W
R1032	401 016 4707	CARBON 22K JA 1/4W
R1033	401 012 5609	CARBON 1K JA 1/4W
R1035	401 020 0702	CARBON 470 JA 1/4W
R1036	401 014 4006	CARBON 1.5K JA 1/4W
R1038	401 012 5609	CARBON 1K JA 1/4W
R1040	401 014 2804	CARBON 150 JA 1/4W
R1041	401 012 4404	CARBON 100 JA 1/4W
R1042	401 012 5609	CARBON 1K JA 1/4W
R1043	401 016 3700	CARBON 2.2K JA 1/4W
R1044	401 013 6308	CARBON 12K JA 1/4W
R1046	401 018 4804	CARBON 33K JA 1/4W
R1047	401 023 2703	CARBON 8.2K JA 1/4W
R1048	401 020 1907	CARBON 4.7K JA 1/4W
R1049	401 013 6308	CARBON 12K JA 1/4W
R1052	401 012 5609	CARBON 1K JA 1/4W
R1053	401 018 2701	CARBON 330 JA 1/4W
R1054	401 018 3708	CARBON 3.3K JA 1/4W
R1058	401 017 1705	CARBON 2.7K JA 1/4W
R1059	401 015 2605	CARBON 1.8K JA 1/4W
R1063	401 016 4707	CARBON 22K JA 1/4W
R1065	401 012 5609	CARBON 1K JA 1/4W
R1071	401 017 1705	CARBON 2.7K JA 1/4W
R1072	401 015 2605	CARBON 1.8K JA 1/4W
R1104	401 021 1807	CARBON 560 JA 1/4W
R1105	401 012 5609	CARBON 1K JA 1/4W
R1106	401 012 5609	CARBON 1K JA 1/4W
R1107	401 016 3700	CARBON 2.2K JA 1/4W
R1153	401 020 1907	CARBON 4.7K JA 1/4W
R1154	401 020 1907	CARBON 4.7K JA 1/4W
R1312	401 012 6903	CARBON 10K JA 1/4W
R1601	401 021 1807	CARBON 560 JA 1/4W
R1602	401 022 0700	CARBON 68 JA 1/4W
R1621	401 016 4707	CARBON 22K JA 1/4W
R1622	401 019 7705	CARBON 4.3K JA 1/4W
R1623	401 014 4006	CARBON 1.5K JA 1/4W
R1624	401 012 6903	CARBON 10K JA 1/4W
R1625	401 022 3008	CARBON 6.8K JA 1/4W
R1626	401 012 8006	CARBON 100K JA 1/4W
R1627	401 016 2505	CARBON 220 JA 1/4W
R1628	401 012 4404	CARBON 100 JA 1/4W
R1629	401 016 3700	CARBON 2.2K JA 1/4W
R1630	401 014 4006	CARBON 1.5K JA 1/4W
R1631	401 022 3008	CARBON 6.8K JA 1/4W
R1632	401 012 5609	CARBON 1K JA 1/4W
R1633	401 021 1807	CARBON 560 JA 1/4W
R1691	401 022 1806	CARBON 680 JA 1/4W
R1693	401 012 5609	CARBON 1K JA 1/4W
R2001	401 017 1705	CARBON 2.7K JA 1/4W
R2002	401 012 6903	CARBON 10K JA 1/4W
R2003	401 017 3709	CARBON 270K JA 1/4W
R2004	401 016 7401	CARBON 240 JA 1/4W
R2005	401 016 0006	CARBON 20K JA 1/4W
R2006	401 016 3700	CARBON 2.2K JA 1/4W
R2007	401 014 9001	CARBON 16K JA 1/4W
R2008	401 014 5102	CARBON 15K JA 1/4W
R2010	401 018 3708	CARBON 3.3K JA 1/4W
R2013 ⚠	402 068 1102	FUSIBLE RES 22 JA 1/4W
R2015	401 019 6104	CARBON 4.7 JA 1/4W
R2020	401 018 3708	CARBON 3.3K JA 1/4W
R2035	401 014 5102	CARBON 15K JA 1/4W
R2036	401 019 9501	CARBON 47 JA 1/4W
R2038	401 012 4404	CARBON 100 JA 1/4W
R2301	401 020 2805	CARBON 47K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R2302	401 020 2805	CARBON 47K JA 1/4W
R2303	401 016 8408	CARBON 24K JA 1/4W
R2304	401 016 8408	CARBON 24K JA 1/4W
R2305	401 020 2805	CARBON 47K JA 1/4W
R2306	401 020 2805	CARBON 47K JA 1/4W
R2307	401 016 8408	CARBON 24K JA 1/4W
R2308	401 016 8408	CARBON 24K JA 1/4W
R2309	401 018 4804	CARBON 33K JA 1/4W
R2310	401 018 4804	CARBON 33K JA 1/4W
R2311	401 017 9701	CARBON 30K JA 1/4W
R2312	401 017 9701	CARBON 30K JA 1/4W
R2313	401 020 7800	CARBON 510 JA 1/4W
R2314	401 020 7800	CARBON 510 JA 1/4W
R2315	401 020 1907	CARBON 4.7K JA 1/4W
R2316	401 020 1907	CARBON 4.7K JA 1/4W
R2317	401 013 6308	CARBON 12K JA 1/4W
R2318	401 013 6308	CARBON 12K JA 1/4W
R2319	401 019 1802	CARBON 3.9K JA 1/4W
R2320	401 019 1802	CARBON 3.9K JA 1/4W
R2321	401 091 1004	MT-FILM 15K FD 1/4W
R2322	401 107 2308	MT-FILM 12K FD 1/4W
R2323	401 017 1705	CARBON 2.7K JA 1/4W
R2324	401 012 5609	CARBON 1K JA 1/4W
R2329	401 016 2505	CARBON 220 JA 1/4W
R2330	401 016 2505	CARBON 220 JA 1/4W
R2335	401 012 6903	CARBON 10K JA 1/4W
R2336	401 016 4707	CARBON 22K JA 1/4W
R2338	401 019 4605	CARBON 3.9M JA 1/4W
R2339	401 012 5609	CARBON 1K JA 1/4W
R2340	401 013 6308	CARBON 12K JA 1/4W
R2343	401 019 3905	CARBON 390K JA 1/4W
R2344	401 012 6903	CARBON 10K JA 1/4W
R2345	401 012 6903	CARBON 10K JA 1/4W
R2346	401 016 3700	CARBON 2.2K JA 1/4W
R2347	401 012 6903	CARBON 10K JA 1/4W
R2348	401 012 6903	CARBON 10K JA 1/4W
R2349	401 012 6903	CARBON 10K JA 1/4W
R2350	401 020 9200	CARBON 510K JA 1/4W
R2351	401 020 2805	CARBON 47K JA 1/4W
R2352	401 020 2805	CARBON 47K JA 1/4W
R2353	401 016 8408	CARBON 24K JA 1/4W
R2354	401 016 8408	CARBON 24K JA 1/4W
R2360	401 016 4707	CARBON 22K JA 1/4W
R2361	401 012 6903	CARBON 10K JA 1/4W
R2368	401 012 5609	CARBON 1K JA 1/4W
R2371	401 015 2605	CARBON 1.8K JA 1/4W
R2380	401 016 5704	CARBON 220K JA 1/4W
R2403	401 012 5609	CARBON 1K JA 1/4W
R2406	401 012 5609	CARBON 1K JA 1/4W
R3001 ⚠	402 067 7402	FUSIBLE RES 3.3 JA 1/2W
R3002	401 022 7105	CARBON 750 JA 1/4W
R3004	401 014 4006	CARBON 1.5K JA 1/4W
R3008	401 020 2805	CARBON 47K JA 1/4W
R3009	401 020 1907	CARBON 4.7K JA 1/4W
R3010	401 020 1907	CARBON 4.7K JA 1/4W
R3011	401 020 1907	CARBON 4.7K JA 1/4W
R3012	401 020 1907	CARBON 4.7K JA 1/4W
R3013	401 020 1907	CARBON 4.7K JA 1/4W
R3014	401 016 0402	CARBON 200K JA 1/4W
R3015	401 016 0402	CARBON 200K JA 1/4W
R3018	401 012 6903	CARBON 10K JA 1/4W
R3022	401 012 8006	CARBON 100K JA 1/4W
R3023	401 012 5609	CARBON 1K JA 1/4W
R3024	401 012 5609	CARBON 1K JA 1/4W
R3025	401 012 5609	CARBON 1K JA 1/4W
R3026	401 012 5609	CARBON 1K JA 1/4W
R3027	401 012 6903	CARBON 10K JA 1/4W
R3028	401 012 6903	CARBON 10K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R3029	401 012 6903	CARBON 10K JA 1/4W
R3030	401 012 6903	CARBON 10K JA 1/4W
R3032	401 018 4804	CARBON 33K JA 1/4W
R3036	401 012 6903	CARBON 10K JA 1/4W
R3038	401 012 5609	CARBON 1K JA 1/4W
R3043	401 012 6903	CARBON 10K JA 1/4W
R3501	401 012 8006	CARBON 100K JA 1/4W
R3502	401 012 8006	CARBON 100K JA 1/4W
R3503	401 018 5702	CARBON 330K JA 1/4W
R3504	401 014 6000	CARBON 150K JA 1/4W
R3505	401 014 5102	CARBON 15K JA 1/4W
R3506	401 016 5704	CARBON 220K JA 1/4W
R3507	401 014 6000	CARBON 150K JA 1/4W
R3508	401 017 2702	CARBON 27K JA 1/4W
R3516	401 012 6903	CARBON 10K JA 1/4W
R3517	401 020 2805	CARBON 47K JA 1/4W
R3518	401 020 2805	CARBON 47K JA 1/4W
R3520	401 018 5702	CARBON 330K JA 1/4W
R3521	401 012 6903	CARBON 10K JA 1/4W
R3525	401 012 5609	CARBON 1K JA 1/4W
R3526	401 016 3700	CARBON 2.2K JA 1/4W
R3527	401 012 5609	CARBON 1K JA 1/4W
R3528	401 020 7800	CARBON 510 JA 1/4W
R3529	401 020 7800	CARBON 510 JA 1/4W
R3533	401 014 4006	CARBON 1.5K JA 1/4W
R3537	401 023 2703	CARBON 8.2K JA 1/4W
R3546	401 020 1907	CARBON 4.7K JA 1/4W
R3547	401 014 5102	CARBON 15K JA 1/4W
R3549	401 012 6903	CARBON 10K JA 1/4W
R3550	401 023 2703	CARBON 8.2K JA 1/4W
R3551	401 012 6903	CARBON 10K JA 1/4W
R3552	401 012 8006	CARBON 100K JA 1/4W
R3553	401 016 5704	CARBON 220K JA 1/4W
R3555	401 012 8006	CARBON 100K JA 1/4W
R3556	401 012 6903	CARBON 10K JA 1/4W
R3557	401 018 5702	CARBON 330K JA 1/4W
R3558	401 020 0702	CARBON 470 JA 1/4W
R3560	401 012 5609	CARBON 1K JA 1/4W
R6003	401 012 9201	CARBON 1M JA 1/4W (VHR-390G ONLY)
R6004	401 012 9201	CARBON 1M JA 1/4W (VHR-390G ONLY)
R6005	401 021 9902	CARBON 620K JA 1/4W (VHR-390G ONLY)
R6006	401 019 3905	CARBON 390K JA 1/4W
R6007	401 021 4907	CARBON 560K JA 1/4W
R6010	401 018 5702	CARBON 330K JA 1/4W (VHR-390G ONLY)
R6011	401 018 5702	CARBON 330K JA 1/4W (VHR-390G ONLY)
R6014	401 015 9406	CARBON 2K JA 1/4W (VHR-390G ONLY)
R6301	401 020 1907	CARBON 4.7K JA 1/4W
R6302	401 020 0702	CARBON 470 JA 1/4W
R6303	401 018 2701	CARBON 330 JA 1/4W
R6304	401 018 2701	CARBON 330 JA 1/4W
R6309	401 021 1807	CARBON 560 JA 1/4W
R6312	401 012 6903	CARBON 10K JA 1/4W
R6313	401 013 6308	CARBON 12K JA 1/4W
R6314	401 023 2703	CARBON 8.2K JA 1/4W
R6315	401 012 6903	CARBON 10K JA 1/4W
R6316	401 012 5609	CARBON 1K JA 1/4W
R6317	401 012 5609	CARBON 1K JA 1/4W
R6611	401 013 9408	CARBON 1.3K JA 1/4W
R6612	401 015 2605	CARBON 1.8K JA 1/4W
R6613	401 021 1807	CARBON 560 JA 1/4W
R6621	401 021 2903	CARBON 5.6K JA 1/4W
R6622	401 012 5609	CARBON 1K JA 1/4W
R6623	401 023 1607	CARBON 820 JA 1/4W
R6624	401 015 2605	CARBON 1.8K JA 1/4W
R6901	401 012 5609	CARBON 1K JA 1/4W
R6902	401 018 2701	CARBON 330 JA 1/4W
R6903	401 021 8103	CARBON 620 JA 1/4W
R6904	401 012 6903	CARBON 10K JA 1/4W
R6905	401 018 5702	CARBON 330K JA 1/4W
R6906	401 012 6903	CARBON 10K JA 1/4W
R6907	401 018 3708	CARBON 3.3K JA 1/4W
R6908	401 023 0600	CARBON 82 JA 1/4W
R6909	401 012 5609	CARBON 1K JA 1/4W
R6910	401 020 7800	CARBON 510 JA 1/4W
R6911	401 021 2903	CARBON 5.6K JA 1/4W
R6912	401 019 1802	CARBON 3.9K JA 1/4W
R6921	401 019 1802	CARBON 3.9K JA 1/4W (VHR-390G ONLY)
R6923	401 012 6903	CARBON 10K JA 1/4W (VHR-390G ONLY)
R6924	401 012 6903	CARBON 10K JA 1/4W (VHR-390G ONLY)
R6925	401 015 3701	CARBON 18K JA 1/4W (VHR-390G ONLY)
R6926	401 014 5102	CARBON 15K JA 1/4W (VHR-390G ONLY)
R6927	401 013 6308	CARBON 12K JA 1/4W (VHR-390G ONLY)
R6928	401 013 4106	CARBON 120 JA 1/4W (VHR-390G ONLY)
R6930	401 018 4804	CARBON 33K JA 1/4W (VHR-390G ONLY)

(SWITCHES)

S3101	645 000 3363	SWITCH,PUSH,REW
OR	613 139 4308	SW,PUSH,REW
S3102	645 000 3363	SWITCH,PUSH,PLAY
OR	613 139 4308	SW,PUSH,PLAY
S3103	645 000 3363	SWITCH,PUSH,REC
OR	613 139 4308	SW,PUSH,REC
S3104	645 000 3363	SWITCH,PUSH,EJECT
OR	613 139 4308	SW,PUSH,EJECT
S3105	645 000 3363	SWITCH,PUSH,FF
OR	613 139 4308	SW,PUSH,FF
S3106	645 000 3363	SWITCH,PUSH,STOP
OR	613 139 4308	SW,PUSH,STOP
S3107	645 000 3363	SWITCH,PUSH,PAUSE
OR	613 139 4308	SW,PUSH,PAUSE
S3108	645 000 3363	SWITCH,PUSH,POWER
OR	613 139 4308	SW,PUSH,POWER
S3117	645 000 3363	SWITCH,PUSH,CH +
OR	613 139 4308	SW,PUSH,CH +
S3118	645 000 3363	SWITCH,PUSH,CH -
OR	613 139 4308	SW,PUSH,CH -

(PROTECTOR)

PR241	613 138 8888	CIRCUIT PROTECTOR

(MISCELLANEOUS)

	613 053 8055	FIXER

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COMPL PWB,VP-1

COMPL.NO 613 145 6594

(SEMICONDUCTORS)

Q1802	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q

LOCATION	PARTS NO.	DESCRIPTION
Q1802	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 093 0607	TR KSC2785-Y
Q1850	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
OR	405 093 0508	TR KSA1175-Y
Q1851	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 016 1100	TR 2SC2839-F-SPA-AC
OR	405 012 9506	TR 2SC2058S-DCTP-Q
Q1852	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 016 1100	TR 2SC2839-F-SPA-AC
OR	405 012 9506	TR 2SC2058S-DCTP-Q
Q1855	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 093 0607	TR KSC2785-Y
Q2901	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 019 3903	TR 2SC536-G-SPA-AC
OR	405 011 8609	TR 2SC1740S-DCTP-S

(INTEGRATED CIRCUITS)

IC181	409 262 2003	IC LA7374
IC291	409 132 0801	IC LA7270

(DIODES)

D1801	407 007 9904	DIODE GMA01-8T
OR	407 012 4406	DIODE 1SS133-T-77

(VARIABLE RESISTORS)

VR181	613 117 1664	VR.SEMI 1KB
OR	613 002 0345	SEMI VR 1KB
VR182	613 117 1718	VR.SEMI 2.2KB
OR	613 002 0369	SEMI VR 2.2KXB

(INDUCTORS)

L1831	613 014 0838	COIL.INDUCTOR 6.8UHK
OR	613 014 4355	HF CHOKE 6.8UHK
L1832	613 014 0890	COIL.INDUCTOR 22UHK
OR	613 014 4416	HF CHOKE 22UHK
L1833	613 014 0968	COIL.INDUCTOR 82UHK
OR	613 014 4485	HF CHOKE 82UHK
L1834	613 014 0951	COIL.INDUCTOR 68UHK
OR	613 014 4478	HF CHOKE 68UHK
L1851	613 014 0821	COIL.INDUCTOR 5.6UHK
OR	613 014 4348	HF CHOKE 5.6UHK
L1852	613 014 0944	COIL.INDUCTOR 56UHK
OR	613 014 4461	HF CHOKE 56UHK
L1853	613 014 0876	COIL.INDUCTOR 15UHK
OR	613 014 4393	HF CHOKE 15UHK
L1854	613 014 0876	COIL.INDUCTOR 15UHK
OR	613 014 4393	HF CHOKE 15UHK

(CAPACITORS)

C1801	403 154 3307	OS-SOLID	4.7U M	10V
C1802	403 001 1906	CERAMIC	0.01U M	16V
C1803	403 120 8602	CERAMIC	0.015U J	16V
C1804	403 001 1906	CERAMIC	0.01U M	16V
C1805	403 193 8509	ELECT	0.33U M	50V
C1806	403 001 1906	CERAMIC	0.01U M	16V
C1808	403 001 1906	CERAMIC	0.01U M	16V
C1809	403 001 1906	CERAMIC	0.01U M	16V
C1810	403 001 1906	CERAMIC	0.01U M	16V
C1811	403 001 1906	CERAMIC	0.01U M	16V
C1812	403 001 1906	CERAMIC	0.01U M	16V

LOCATION	PARTS NO.	DESCRIPTION		
C1813	403 001 1906	CERAMIC	0.01U M	16V
C1814	403 001 1906	CERAMIC	0.01U M	16V
C1815	403 001 8004	CERAMIC	0.047U M	16V
C1816	403 001 8004	CERAMIC	0.047U M	16V
C1817	403 001 8004	CERAMIC	0.047U M	16V
C1818	403 001 8004	CERAMIC	0.047U M	16V
C1831	403 028 3402	CERAMIC	56P J	50V
C1832	403 019 9703	CERAMIC	27P J	50V
C1833	403 072 7500	CERAMIC	330P J	50V
C1834	403 073 2702	CERAMIC	390P J	50V
C1835	403 075 3103	CERAMIC	82P J	50V
C1851	403 001 1906	CERAMIC	0.01U M	16V
C1852	403 022 7703	CERAMIC	33P J	50V
C1853	403 022 7703	CERAMIC	33P J	50V
C1854	403 026 2209	CERAMIC	47P J	50V
C1855	403 028 3402	CERAMIC	56P J	50V
C1861	403 001 1906	CERAMIC	0.01U M	16V
C1862	403 163 7907	ELECT	47U M	6.3V
C2901	403 163 7907	ELECT	47U M	6.3V
C2902	403 001 1906	CERAMIC	0.01U M	16V
C2903	403 001 1906	CERAMIC	0.01U M	16V
C2904	403 001 1906	CERAMIC	0.01U M	16V
C2905	403 163 8409	ELECT	47U M	16V
C2906	403 001 1906	CERAMIC	0.01U M	16V
C2907	403 001 1906	CERAMIC	0.01U M	16V
C2908	403 193 8202	ELECT	0.1U M	50V
C2909	403 001 1906	CERAMIC	0.01U M	16V
C2910	403 001 1906	CERAMIC	0.01U M	16V
C2911	403 001 1906	CERAMIC	0.01U M	16V
C2912	403 001 1906	CERAMIC	0.01U M	16V
C2913	403 001 1906	CERAMIC	0.01U M	16V

(RESISTORS)

R1801	401 021 2903	CARBON	5.6K JA	1/4W
R1802	401 013 6308	CARBON	12K JA	1/4W
R1803	401 016 4707	CARBON	22K JA	1/4W
R1805	401 016 4707	CARBON	22K JA	1/4W
R1806	401 012 5609	CARBON	1K JA	1/4W
R1807	401 020 0702	CARBON	470 JA	1/4W
R1808	401 016 3700	CARBON	2.2K JA	1/4W
R1809	401 016 3700	CARBON	2.2K JA	1/4W
R1810	401 012 5609	CARBON	1K JA	1/4W
R1811	401 013 9408	CARBON	1.3K JA	1/4W
R1812	401 021 2903	CARBON	5.6K JA	1/4W
R1813	401 021 2903	CARBON	5.6K JA	1/4W
R1814	401 018 4804	CARBON	33K JA	1/4W
R1815	401 018 4804	CARBON	33K JA	1/4W
R1816	401 016 3700	CARBON	2.2K JA	1/4W
R1817	401 016 3700	CARBON	2.2K JA	1/4W
R1831	401 021 1807	CARBON	560 JA	1/4W
R1832	401 020 0702	CARBON	470 JA	1/4W
R1850	401 015 2605	CARBON	1.8K JA	1/4W
R1851	401 012 5609	CARBON	1K JA	1/4W
R1852	401 016 4707	CARBON	22K JA	1/4W
R1853	401 016 4707	CARBON	22K JA	1/4W
R1854	401 019 0904	CARBON	390 JA	1/4W
R1855	401 019 0904	CARBON	390 JA	1/4W
R1856	401 023 1607	CARBON	820 JA	1/4W
R1857	401 023 1607	CARBON	820 JA	1/4W
R1858	401 023 1607	CARBON	820 JA	1/4W
R1859	401 014 4006	CARBON	1.5K JA	1/4W
R1860	401 017 0708	CARBON	270 JA	1/4W
R1873	401 012 5609	CARBON	1K JA	1/4W
R2901	401 019 6104	CARBON	4.7 JA	1/4W
R2902	401 012 3308	CARBON	10 JA	1/4W
R2903	401 015 1509	CARBON	180 JA	1/4W
R2904	401 013 4106	CARBON	120 JA	1/4W

LOCATION	PARTS NO.	DESCRIPTION
R2905	401 012 5609	CARBON 1K JA 1/4W
R2906	401 016 3700	CARBON 2.2K JA 1/4W
R2907	401 015 1509	CARBON 180 JA 1/4W
R2908	401 012 5609	CARBON 1K JA 1/4W

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COMPL PWB,TM-1
COMPL.NO 613 144 4461

(REMOTE RECEIVERS)

RR711	613 129 0938	IR RECEIVER PACK UNIT
OR	613 134 9087	IR RECEIVER PACK UNIT

(DISPLAYS)

A7101	613 140 4007	FLUORESCENT TUBE
OR	613 140 4014	FLUORESCENT TUBE

(MISCELLANEOUS)

	613 139 2267	HOLDER FL

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COMPL PCB,TM-8
COMPL.NO 613 134 4730

(INTEGRATED CIRCUIT)

IC781	409 148 5104	IC SDA5642

(CAPACITORS)

C7802	403 013 3103	CERAMIC 150P J 50V
C7803	403 256 4608	MT-COMPO 0.33U J 50V
C7804	403 057 2407	POLYESTER 0.1U J 50V

(RESISTORS)

R7805	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R7806	401 037 5806	MT-GLAZE 1M JA 1/10W
R7807	401 039 0601	MT-GLAZE 820K JA 1/10W
R7808	401 037 5707	MT-GLAZE 100K JA 1/10W
R7809	401 037 5608	MT-GLAZE 10K JA 1/10W
R7810	401 037 7008	MT-GLAZE 1.2M JA 1/10W
R7811	401 037 5202	MT-GLAZE 100 JA 1/10W
R7812	401 038 7700	MT-GLAZE 5.6K JA 1/10W

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COMPL PWB,PW-1
COMPL.NO 613 147 5663 (VHR-390G)
COMPL.NO 613 146 8290 (VHR-390EV)

(SEMICONDUCTORS)

Q5001	405 122 9601	TR 2SK2083-FD13
Q5002	405 017 9600	TR 2SC3330-T-AC
Q5003	405 088 9103	TR 2SA1703-S-AN

(INTEGRATED CIRCUITS)

IC511	409 067 7203	IC L5431-AA
IC512	409 297 7400	IC PQ12SZ11

(DIODES)

LOCATION	PARTS NO.	DESCRIPTION
D5001	407 134 8900	DIODE DBC10G
D5003	407 091 6704	DIODE AP01C-V0
D5004	407 078 2705	DIODE 1SS244-T-77
D5005	407 078 2705	DIODE 1SS244-T-77
D5006	407 050 9302	ZENER DIODE GZB18C
D5007	407 078 2705	DIODE 1SS244-T-77
D5008	407 078 2705	DIODE 1SS244-T-77
D5011 ⚠	407 151 3308	PHOTO COUPLE PC120FB
D5101	407 158 1505	DIODE ERC30-02L38
D5102	408 019 0705	DIODE ERB84-009L38
D5103	407 100 6909	DIODE AG01-V2
OR	407 091 6902	DIODE ERA38-04-V5
D5104	407 078 2705	DIODE 1SS244-T-77
D5105	407 100 6909	DIODE AG01-V2
OR	407 091 6902	DIODE ERA38-04-V5
D5109	407 099 5105	ZENER DIODE MTZJ4.7B-T-77
D5113	407 099 7604	ZENER DIODE MTZJ18B-T-77
D5114	407 153 6208	THYRISTOR 3P4J

(INDUCTORS)

L5001 ⚠	645 003 3858	LINE FILTER(VHR-390G ONLY)
L5002 ⚠	613 140 6438	COIL.LINE FILTER
L5101	613 107 6884	FERRITE CORE
L5102	613 110 4198	COIL.INDUCTOR 10UH K
OR	645 002 4122	INDUCTOR 10U K

(TRANSFORMER)

T5001 ⚠	645 002 4412	TRANS.POWER.PULSE

(CAPACITORS)

C5001 ⚠	404 055 5001	MT-POLYEST 0.22U M 250V
C5002 ⚠	404 055 4905	MT-POLYEST 0.068U M 250V
C5003 ⚠	404 032 8407	CERAMIC 470P M 400V
C5004 ⚠	404 032 8605	CERAMIC 1500P M 400V (VHR-390G ONLY)
OR ⚠	404 032 8704	CERAMIC 2200P M 400V (VHR-390EV ONLY)
C5010	403 238 1809	ELECT 47U M 400V
C5011	403 222 1808	ELECT 1U M 400V
C5012	403 058 9504	POLYESTER 0.018U J 50V
C5013	403 058 9504	POLYESTER 0.018U J 50V
C5014	403 243 9203	ELECT 2.2U M 250V
C5016	403 094 0800	OS-SOLID 2.2U M 16V
C5017	403 061 7702	POLYESTER 4700P J 50V
C5101	403 204 6401	ELECT 1000U M 16V
C5102	403 148 0305	ELECT 470U M 16V
C5104	403 243 8909	ELECT 1000U M 10V
C5105	403 147 9507	ELECT 470U M 6.3V
C5106	403 154 8302	ELECT 47U M 50V
C5107	403 126 4608	ELECT 100U M 25V
C5108	403 155 5409	ELECT 220U M 6.3V
C5109	403 168 6103	MT-POLYEST 0.1U J 50V
C5110	403 168 6103	MT-POLYEST 0.1U J 50V
C5111	403 121 9509	CERAMIC 0.1U Z 50V
C5112	403 126 4509	ELECT 100U M 16V

(RESISTORS)

R5001 ⚠	402 064 1502	CARBON 2.7M KA 1/2W
R5010	401 069 4402	OXIDE-MT 68K JA 2W
R5011	401 090 1906	CARBON 1.5M JA 1/2W
R5012	401 016 4707	CARBON 22K JA 1/4W
R5014	401 019 3905	CARBON 390K JA 1/4W
R5015	401 019 3905	CARBON 390K JA 1/4W
R5016	401 019 3905	CARBON 390K JA 1/4W
R5017	401 019 3905	CARBON 390K JA 1/4W
R5018	401 009 5001	CARBON 33 JA 1/2W
R5019	401 007 0305	CARBON 100 JA 1/2W
R5020	401 057 5107	OXIDE-MT 0.47 JA 1W
R5021	401 017 2702	CARBON 27K JA 1/4W
R5022	401 011 8809	CARBON 1 JA 1/4W
R5023	401 016 1409	CARBON 22 JA 1/4W
R5024	401 012 6903	CARBON 10K JA 1/4W
R5025	401 012 5609	CARBON 1K JA 1/4W
R5103	401 014 2804	CARBON 150 JA 1/4W
R5105	401 107 5200	MT-FILM 560 FD 1/4W
R5106	401 107 5309	MT-FILM 620 FD 1/4W
R5107	401 012 4404	CARBON 100 JA 1/4W
R5108	401 021 2903	CARBON 5.6K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R5109	401 106 9704	MT-FILM 82 FD 1/4W
R5112	401 013 6308	CARBON 12K JA 1/4W
R5113	401 154 6403	CARBON 430 JA 1/2W (VHR-390G ONLY)
OR	401 011 5709	CARBON 820 JA 1/2W (VHR-390EV ONLY)
R5114	401 154 6403	CARBON 430 JA 1/2W (VHR-390G ONLY)
OR	401 011 5709	CARBON 820 JA 1/2W (VHR-390EV ONLY)
R5118	401 023 2703	CARBON 8.2K JA 1/4W
R5119	401 016 3700	CARBON 2.2K JA 1/4W
R5120 ⚠	402 067 7600	FUSIBLE RES 1.5 JA 1/4W
R5121	401 016 1201	CARBON 22 JB 1/4W
(FUSE)		
F5001 ⚠	423 022 6506	FUSE 250V 2.5A
(CONNECTOR)		
CN501 ⚠	613 120 7912	CONNECTOR,INLET
(MISCELLANEOUS)		
	613 136 4554	HOLDER,FUSE

****

COMPL PWB,TB-1

COMPL.NO	613 147 3867	(VHR-390G)
COMPL.NO	613 145 6600	(VHR-390EV)
(SEMICONDUCTORS)		
Q8651	405 057 6201	TR 2SC4038-Q-TL2
OR	405 057 6409	TR 2SC4038-R-TL2
OR	405 123 7002	TR 2SD1991A-Q-(TA)
OR	405 123 7101	TR 2SD1991A-R-(TA)
Q8652	405 064 0100	TR 2SA1561-TL2-Q
OR	405 064 0209	TR 2SA1561-TL2-R
OR	405 123 6708	TR 2SB1320A-Q-(TA)
OR	405 123 6807	TR 2SB1320A-R-(TA)
(INTEGRATED CIRCUITS)		
IC861	409 120 3401	IC LA7221
OR	409 003 4501	IC BA7021
(DIODES)		
D8601	407 070 7104	ZENER DIODE GZS5.6X-BT
OR	407 053 6704	ZENER DIODE MTZ5.6B-T-77
D8602	407 070 7104	ZENER DIODE GZS5.6X-BT
OR	407 053 6704	ZENER DIODE MTZ5.6B-T-77
D8651	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
(CAPACITORS)		
C8502	403 071 5408	CERAMIC 220P J 50V
C8504	403 071 5408	CERAMIC 220P J 50V
C8506	403 069 0309	CERAMIC 1000P J 50V
C8508	403 069 0309	CERAMIC 1000P J 50V
C8513	403 071 5408	CERAMIC 220P J 50V
C8522	403 071 5408	CERAMIC 220P J 50V
C8524	403 071 5408	CERAMIC 220P J 50V
C8526	403 069 0309	CERAMIC 1000P J 50V
C8528	403 069 0309	CERAMIC 1000P J 50V
C8533	403 071 5408	CERAMIC 220P J 50V
C8601	403 189 2405	ELECT 10U M 16V
C8602	403 248 1905	ELECT 10U M 16V
C8603	403 068 8801	CERAMIC 100P J 50V (VHR-390G ONLY)
C8604	403 121 9509	CERAMIC 0.1U Z 50V
C8605	403 121 9509	CERAMIC 0.1U Z 50V

LOCATION	PARTS NO.	DESCRIPTION
C8611	403 179 4501	NP-ELECT 0.47U M 50V
(RESISTORS)		
R8501	401 012 5609	CARBON 1K JA 1/4W
R8502	401 012 5609	CARBON 1K JA 1/4W
R8503	401 022 1806	CARBON 680 JA 1/4W
R8504	401 022 1806	CARBON 680 JA 1/4W
R8505	401 016 5704	CARBON 220K JA 1/4W
R8508	401 012 5609	CARBON 1K JA 1/4W
R8521	401 012 5609	CARBON 1K JA 1/4W
R8522	401 012 5609	CARBON 1K JA 1/4W
R8523	401 022 1806	CARBON 680 JA 1/4W
R8524	401 022 1806	CARBON 680 JA 1/4W
R8525	401 016 5704	CARBON 220K JA 1/4W
R8528	401 012 5609	CARBON 1K JA 1/4W
R8601	401 022 6702	CARBON 75 JA 1/4W
R8602	401 022 6702	CARBON 75 JA 1/4W
R8603	401 012 5609	CARBON 1K JA 1/4W
R8604	401 012 5609	CARBON 1K JA 1/4W
R8605	401 012 5609	CARBON 1K JA 1/4W
R8626	401 018 2701	CARBON 330 JA 1/4W
R8627	401 018 2701	CARBON 330 JA 1/4W
R8651	401 012 6903	CARBON 10K JA 1/4W
R8652	401 021 2903	CARBON 5.6K JA 1/4W
R8653	401 021 2903	CARBON 5.6K JA 1/4W
R8654	401 021 0602	CARBON 56 JA 1/4W
R8655	401 013 6308	CARBON 12K JA 1/4W
R8656	401 023 2703	CARBON 8.2K JA 1/4W
R8657	401 020 1907	CARBON 4.7K JA 1/4W
R8663	401 012 6903	CARBON 10K JA 1/4W
(JACKS)		
JK851	613 009 1529	SOCKET
JK852	613 085 8092	SOCKET
JK853	613 009 1529	SOCKET
JK854	613 085 8092	SOCKET
(CONNECTORS)		
CN871	613 105 6633	SOCKET,21P
CN872	613 105 6640	SOCKET,21P

****

COMPL PCB,MC-1

COMPL.NO	613 120 9060	
(DIODES)		
D8001	407 094 1300	PHOTO COUPLE SPI-315-04-C
OR	407 043 0101	PHOTO DIODE ON2170-R
(RESISTORS)		
R8001	401 026 0607	CARBON 270 JA 1/6W
OR	401 017 0708	CARBON 270 JA 1/4W
R8002	401 024 6700	CARBON 100 JA 1/6W
OR	401 012 4404	CARBON 100 JA 1/4W
(SWITCH)		
S8001	613 022 4545	SPECIAL SWITCH

****

FLEXIBLE FLAT CABLE

	613 140 4069	FLEXIBLE FLAT CABLES CP-1 - MC-2

SANYO

SANYO Electric Co., Ltd.
Osaka, Japan

June/'93/1750 NS Printed in Japan

VHR-390G
VHR-390EV

BLOCK DIAGRAMS,CIRCUIT DIAGRAMS & PRINTED WIRING BOARDS

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REFERENCE NO.SM531252

NOTES:

1. All resistance values in "OHMS" unless otherwise noted. (K=1,000 M=1,000,000)
2. All capacitance values in "μfd" unless otherwise noted. p=pico farad
3. All inductance values in "mH" unless otherwise noted. μ=micro henry

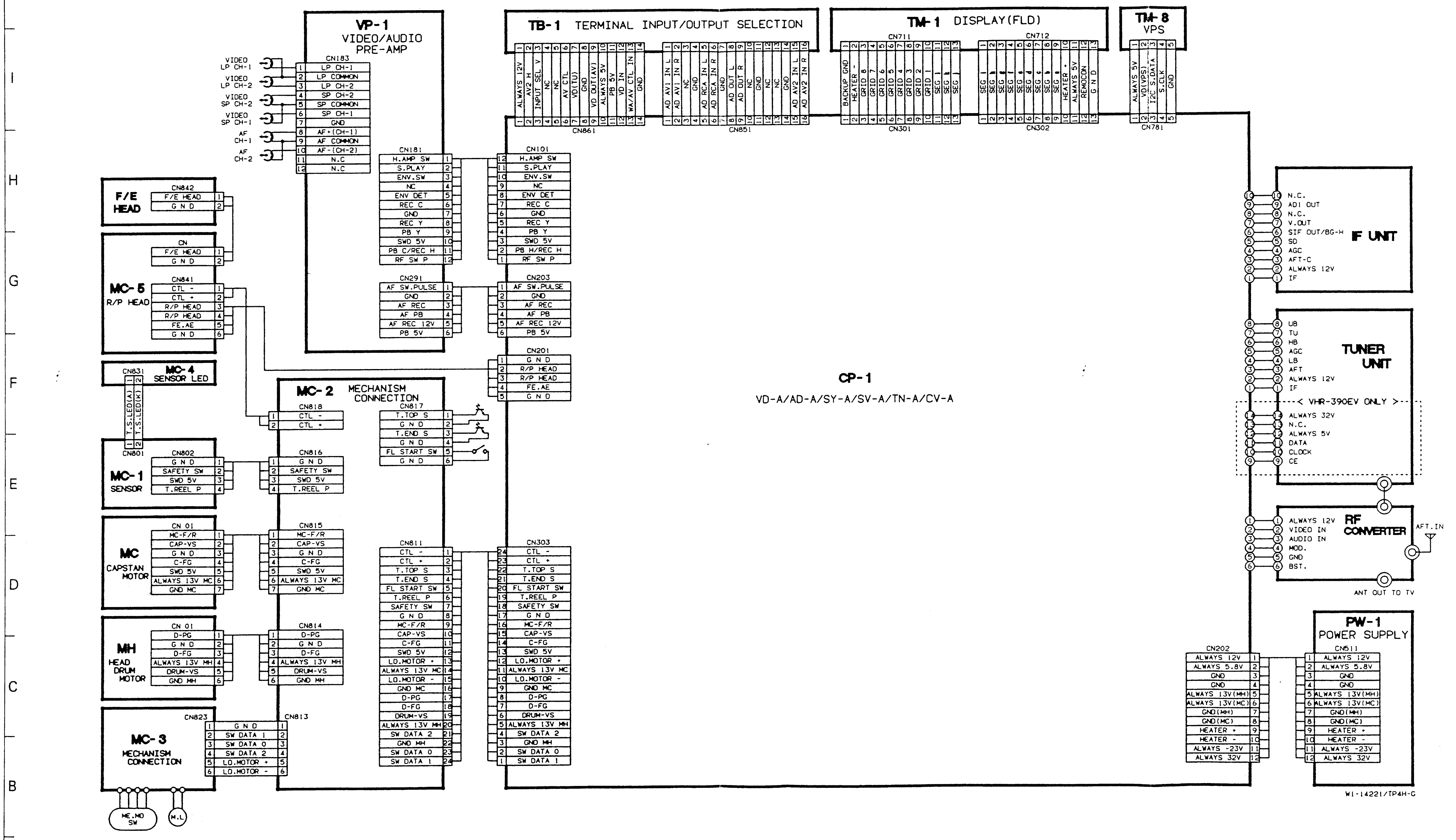
PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A SYMBOL (⚠) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY. SHOULD ANY COMPONENT DESIGNATED BY A SYMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST. DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

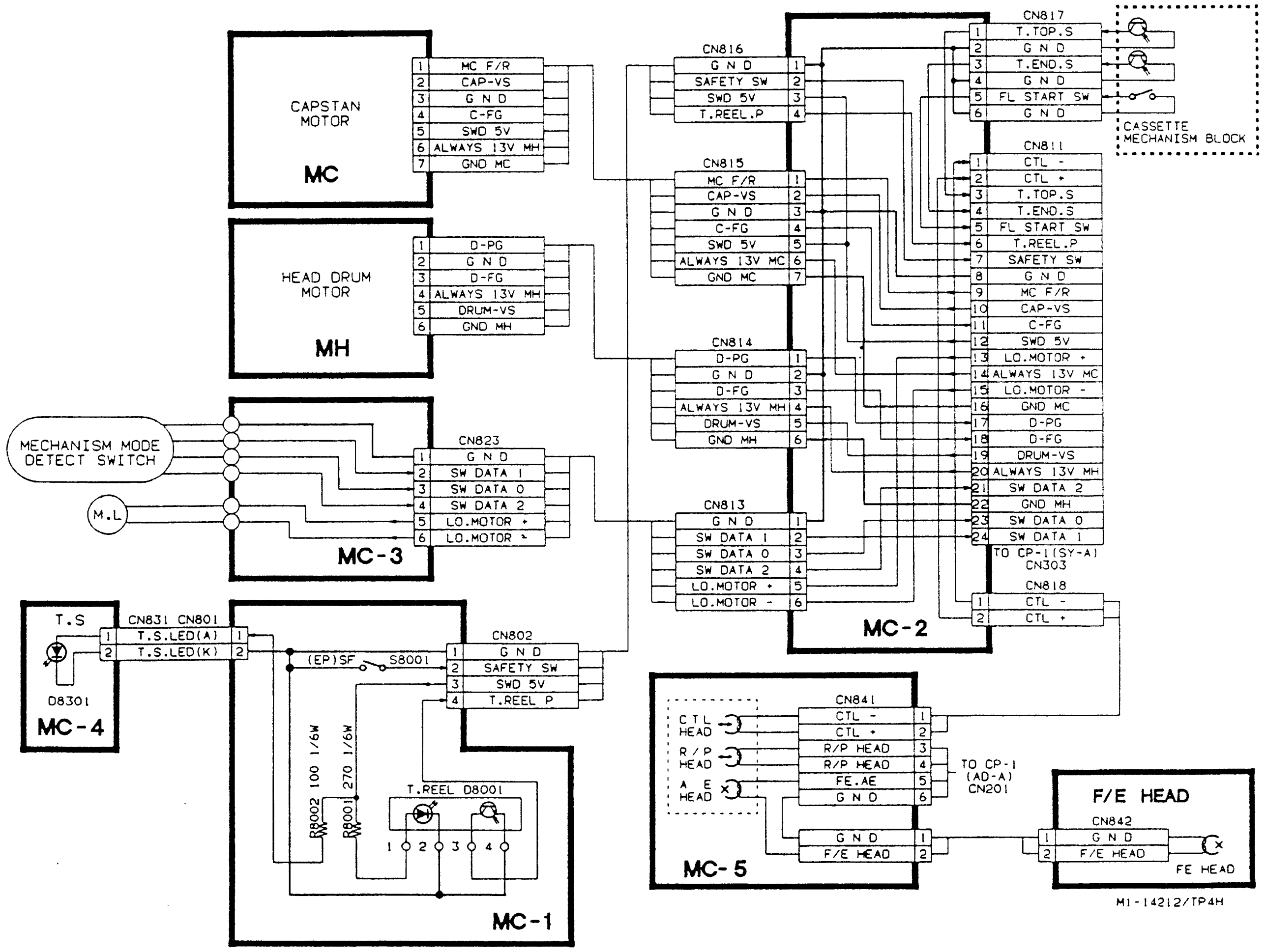
PAL-A

1. OVERALL WIRING,MECHANISM CONNECTION, & BLOCK DIAGRAMS

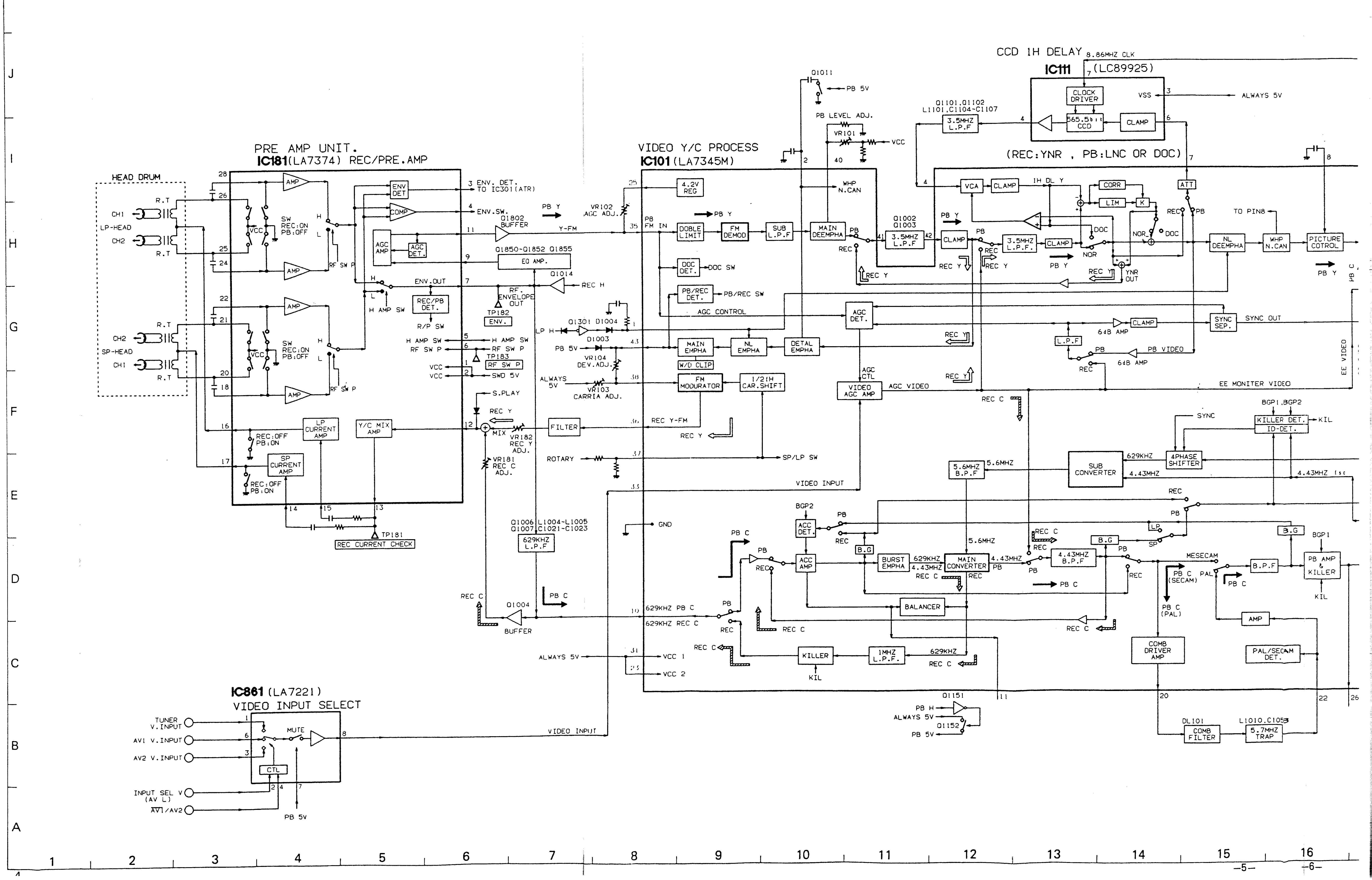
OVERALL WIRING


VP-1 VIDEO/AUDIO PRE-AMP
CN183
VIDEO LP CH-1
VIDEO LP CH-2
VIDEO SP CH-2
VIDEO SP CH-1
AF CH-1
AF CH-2
LP CH-1
LP COMMON
LP CH-2
SP CH-2
SP COMMON
SP CH-1
GND
AF+(CH-1)
AF COMMON
AF-(CH-2)
N.C
CN181
CN291
TB-1 TERMINAL INPUT/OUTPUT SELECTION
CN861
CN851
TM-1 DISPLAY(FLD)
CN711
CN712
CN301
CN302
TM-8 VPS
CN781
CN101
CN203
CN201
H.AMP SW
S.PLAY
ENV.SW
ENV DET
REC C
REC Y
PB Y
SWD 5V
PB C/REC H
RF SW P
AF SW.PULSE
AF REC
AF PB
AF REC 12V
PB 5V
R/P HEAD
FE.AE
F/E HEAD
CN842
MC-5 R/P HEAD
CN841
CTL -
CTL +
MC-4 SENSOR LED
CN831
T.S.LED(A)
T.S.LED(K)
CN801
MC-1 SENSOR
CN802
SAFETY SW
T.REEL P
MC CAPSTAN MOTOR
CN 01
MC-F/R
CAP-VS
C-FG
ALWAYS 13V MC
GND MC
MH HEAD DRUM MOTOR
D-PG
D-FG
ALWAYS 13V MH
DRUM-VS
GND MH
MC-3 MECHANISM CONNECTION
CN823
SW DATA 1
SW DATA 0
SW DATA 2
LO.MOTOR +
LO.MOTOR -
ME.MO SW
M.L
MC-2 MECHANISM CONNECTION
CN818
CN817
T.TOP S
T.END S
FL START SW
CN816
CN815
CN814
CN813
CN811
CN303
CP-1
VD-A/AD-A/SY-A/SV-A/TN-A/CV-A
IF UNIT
N.C.
AD1 OUT
V.OUT
SIF OUT/BG-H
SD
AGC
AFT-C
ALWAYS 12V
IF
TUNER UNIT
UB
TU
HB
LB
AFT
< VHR-390EV ONLY >
ALWAYS 32V
ALWAYS 5V
DATA
CLOCK
CE
RF CONVERTER
VIDEO IN
AUDIO IN
MOD.
GND
BST.
AFT.IN
ANT OUT TO TV
PW-1 POWER SUPPLY
CN511
CN202
ALWAYS 5.8V
ALWAYS 13V(MH)
ALWAYS 13V(MC)
GND(MH)
GND(MC)
HEATER +
HEATER -
ALWAYS -23V
WI-14221/TP4H-G

MECHANISM CONNECTION

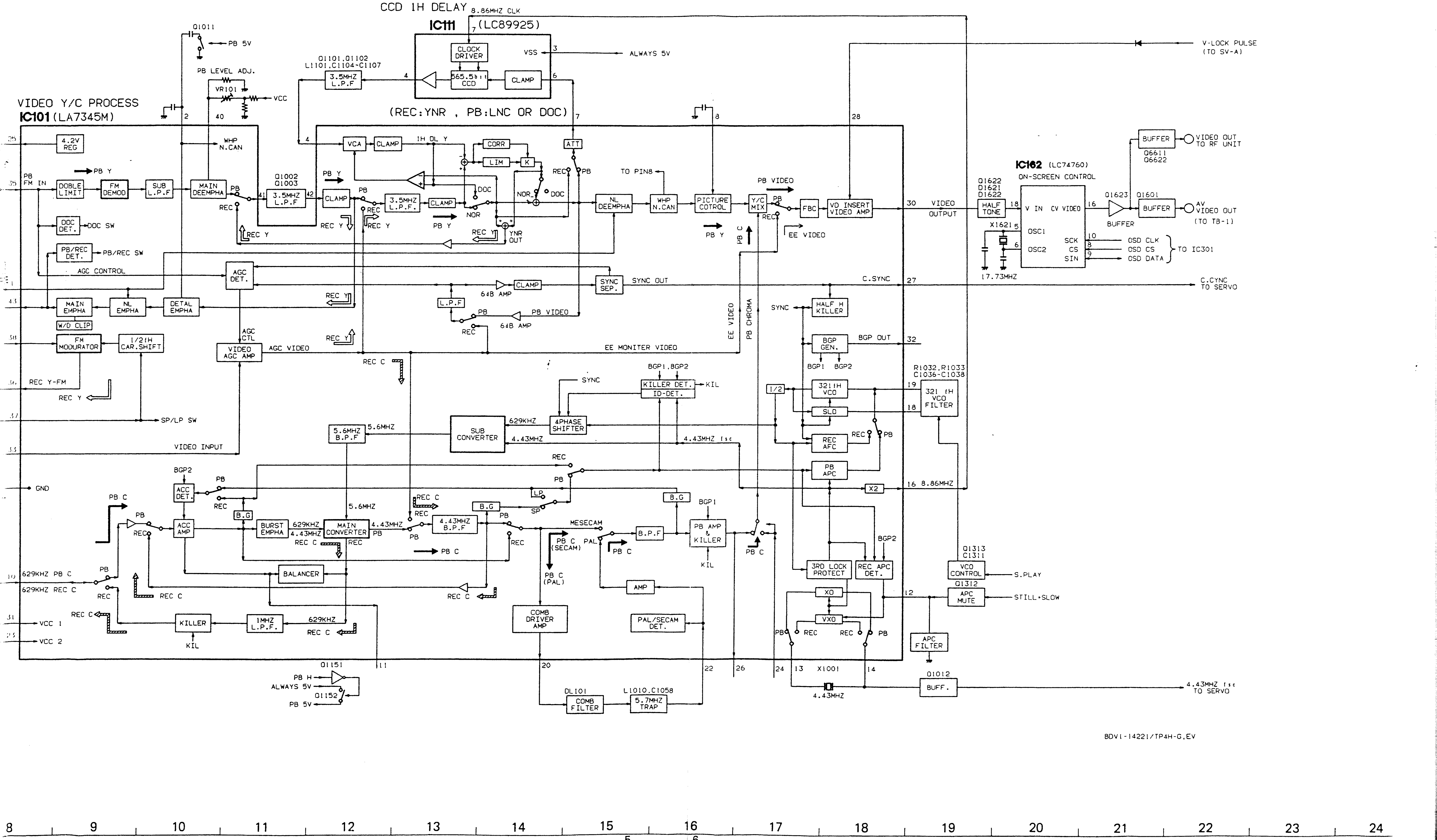

CAPSTAN MOTOR
MC
1 MC F/R
2 CAP-VS
3 G N D
4 C-FG
5 SWD 5V
6 ALWAYS 13V MH
7 GND MC
HEAD DRUM MOTOR
MH
1 D-PG
2 G N D
3 D-FG
4 ALWAYS 13V MH
5 DRUM-VS
6 GND MH
MECHANISM MODE DETECT SWITCH
M.L
CN823
1 G N D
2 SW DATA 1
3 SW DATA 0
4 SW DATA 2
5 LO.MOTOR +
6 LO.MOTOR -
MC-3
T.S
CN831 CN801
1 T.S.LED(A) 1
2 T.S.LED(K) 2
D8301
MC-4
(EP)SF
S8001
CN802
1 G N D
2 SAFETY SW
3 SWD 5V
4 T.REEL P
R8002 100 1/6W
R8001 270 1/6W
T.REEL D8001
1 2 3 4
MC-1
CN816
G N D 1
SAFETY SW 2
SWD 5V 3
T.REEL.P 4
CN815
MC F/R 1
CAP-VS 2
G N D 3
C-FG 4
SWD 5V 5
ALWAYS 13V MC 6
GND MC 7
CN814
D-PG 1
G N D 2
D-FG 3
ALWAYS 13V MH 4
DRUM-VS 5
GND MH 6
CN813
G N D 1
SW DATA 1 2
SW DATA 0 3
SW DATA 2 4
LO.MOTOR + 5
LO.MOTOR - 6
MC-2
CN817
1 T.TOP.S
2 G N D
3 T.END.S
4 G N D
5 FL START SW
6 G N D
CASSETTE MECHANISM BLOCK
CN811
1 CTL -
2 CTL +
3 T.TOP.S
4 T.END.S
5 FL START SW
6 T.REEL.P
7 SAFETY SW
8 G N D
9 MC F/R
10 CAP-VS
11 C-FG
12 SWD 5V
13 LO.MOTOR +
14 ALWAYS 13V MC
15 LO.MOTOR -
16 GND MC
17 D-PG
18 D-FG
19 DRUM-VS
20 ALWAYS 13V MH
21 SW DATA 2
22 GND MH
23 SW DATA 0
24 SW DATA 1
TO CP-1(SY-A) CN303
CN818
1 CTL -
2 CTL +
CTL HEAD
R/P HEAD
A E HEAD
CN841
CTL - 1
CTL + 2
R/P HEAD 3
R/P HEAD 4
FE.AE 5
G N D 6
TO CP-1 (AD-A) CN201
G N D 1
F/E HEAD 2
MC-5
F/E HEAD
CN842
1 G N D
2 F/E HEAD
FE HEAD
MI-14212/TP4H

VIDEO CIRCUIT

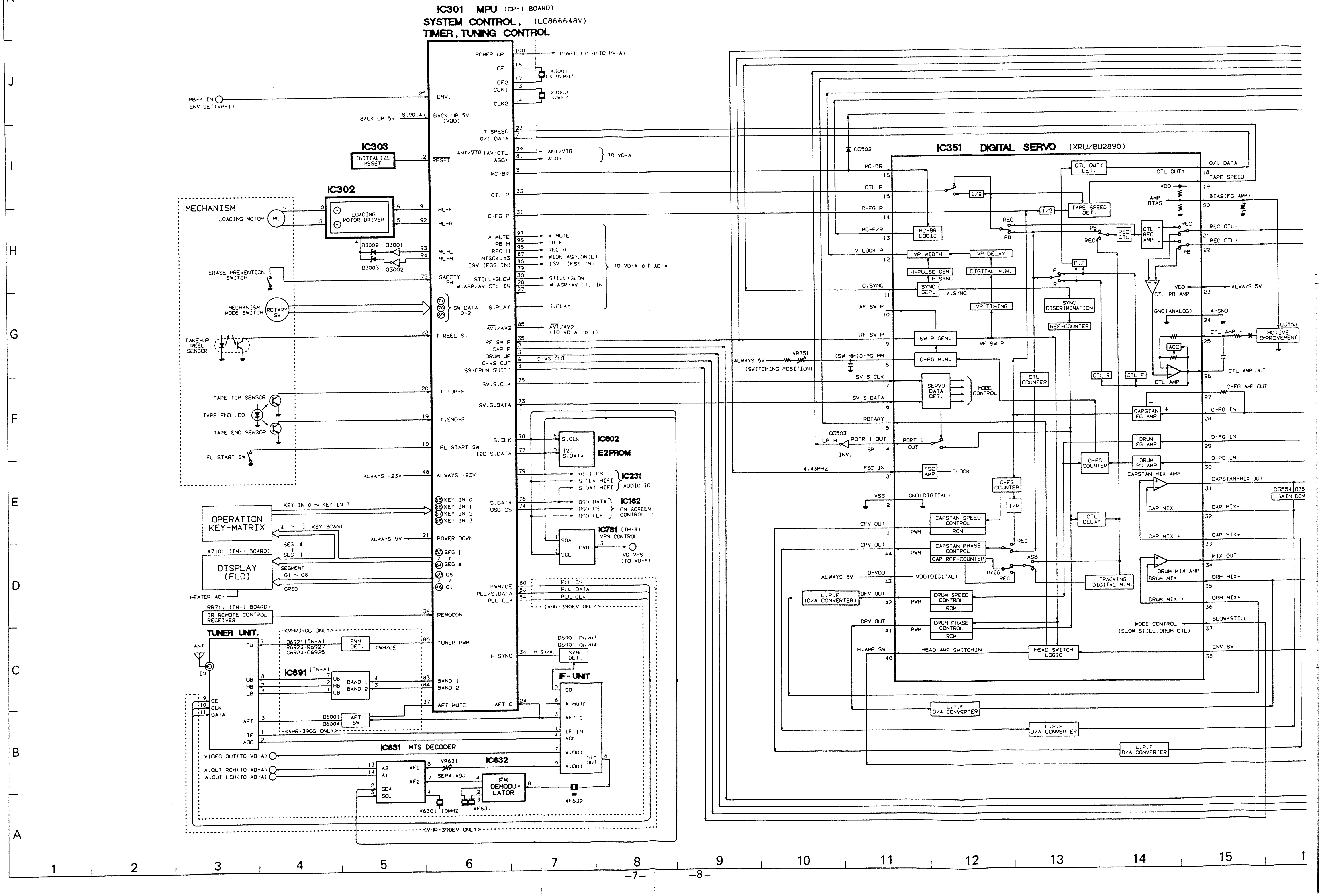


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
HEAD DRUM
CH1
LP-HEAD
CH2
R.T
SP-HEAD
PRE AMP UNIT.
IC181(LA7374) REC/PRE.AMP
AMP
SW
REC:ON
PB:OFF
VCC
H
L
RF SW P
ENV DET
COMP
AGC AMP
AGC DET.
REC/PB DET.
H AMP SW
R/P SW
LP CURRENT AMP
SP CURRENT AMP
REC:OFF
PB:ON
Y/C MIX AMP
3 ENV. DET. → TO IC301(ATR)
4 ENV.SW.
Q1802 BUFFER
Y-FM
Q1850~Q1852 Q1855
EQ AMP.
ENV.OUT
RF. ENVELOPE OUT
TP182
ENV.
Q1014
REC H
H AMP SW
RF SW P
TP183
RF SW P
VCC
SWD 5V
S.PLAY
REC Y
MIX
VR182 REC Y ADJ.
VR181 REC C ADJ.
FILTER
TP181
REC CURRENT CHECK
Q1006 L1004~L1005
Q1007 C1021~C1023
629KHZ L.P.F
REC C
Q1004
BUFFER
PB C
PB Y
VR102 AGC ADJ.
ROTARY
LP H
Q1301 D1004
D1003
PB 5V
VR104 DEV.ADJ.
ALWAYS 5V
VR103 CARRIA ADJ.
GND
IC861 (LA7221)
VIDEO INPUT SELECT
TUNER V.INPUT
AV1 V.INPUT
AV2 V.INPUT
INPUT SEL V (AV L)
AV1/AV2
MUTE
CTL
PB 5V
VIDEO INPUT
VIDEO Y/C PROCESS
IC101(LA7345M)
4.2V REG
PB FM IN
DOBLE LIMIT
FM DEMOD
SUB L.P.F
DOC DET.
DOC SW
PB/REC DET.
PB/REC SW
AGC CONTROL
MAIN EMPHA
W/D CLIP
NL EMPHA
DETAL EMPHA
FM MODURATOR
1/2H CAR.SHIFT
REC Y-FM
SP/LP SW
VIDEO INPUT
629KHZ PB C
629KHZ REC C
VCC 1
VCC 2
Q1011
PB LEVEL ADJ.
VR101
VCC
WHP N.CAN
MAIN DEEMPHA
Q1002
Q1003
3.5MHZ L.P.F
AGC DET.
AGC CTL
VIDEO AGC AMP
AGC VIDEO
BGP2
ACC DET.
ACC AMP
B.G
BURST EMPHA
629KHZ
4.43MHZ
MAIN CONVERTER
5.6MHZ
5.6MHZ B.P.F
BALANCER
KILLER
KIL
1MHZ L.P.F.
REC C
Q1151
PB H
ALWAYS 5V
Q1152
CCD 1H DELAY
8.86MHZ CLK
IC111 (LC89925)
CLOCK DRIVER
565.5bit CCD
CLAMP
VSS
ALWAYS 5V
Q1101,Q1102
L1101,C1104~C1107
3.5MHZ L.P.F
(REC:YNR , PB:LNC OR DOC)
VCA
1H DL Y
CORR
LIM
K
ATT
DOC
NOR
YNR OUT
3.5MHZ L.P.F
TO PIN8
NL DEEMPHA
WHP N.CAN
PICTURE COTROL
SYNC SEP.
SYNC OUT
64B AMP
L.P.F
PB VIDEO
EE MONITER VIDEO
EE VIDEO
SYNC
BGP1,BGP2
KILLER DET.
ID-DET.
SUB CONVERTER
4PHASE SHIFTER
4.43MHZ fsc
4.43MHZ B.P.F
MESECAM
PB C (SECAM)
PB C (PAL)
PAL
B.P.F
PB AMP & KILLER
BGP1
AMP
COMB DRIVER AMP
PAL/SECAM DET.
DL101
COMB FILTER
L1010,C1053
5.7MHZ TRAP

VIDEO CIRCUIT

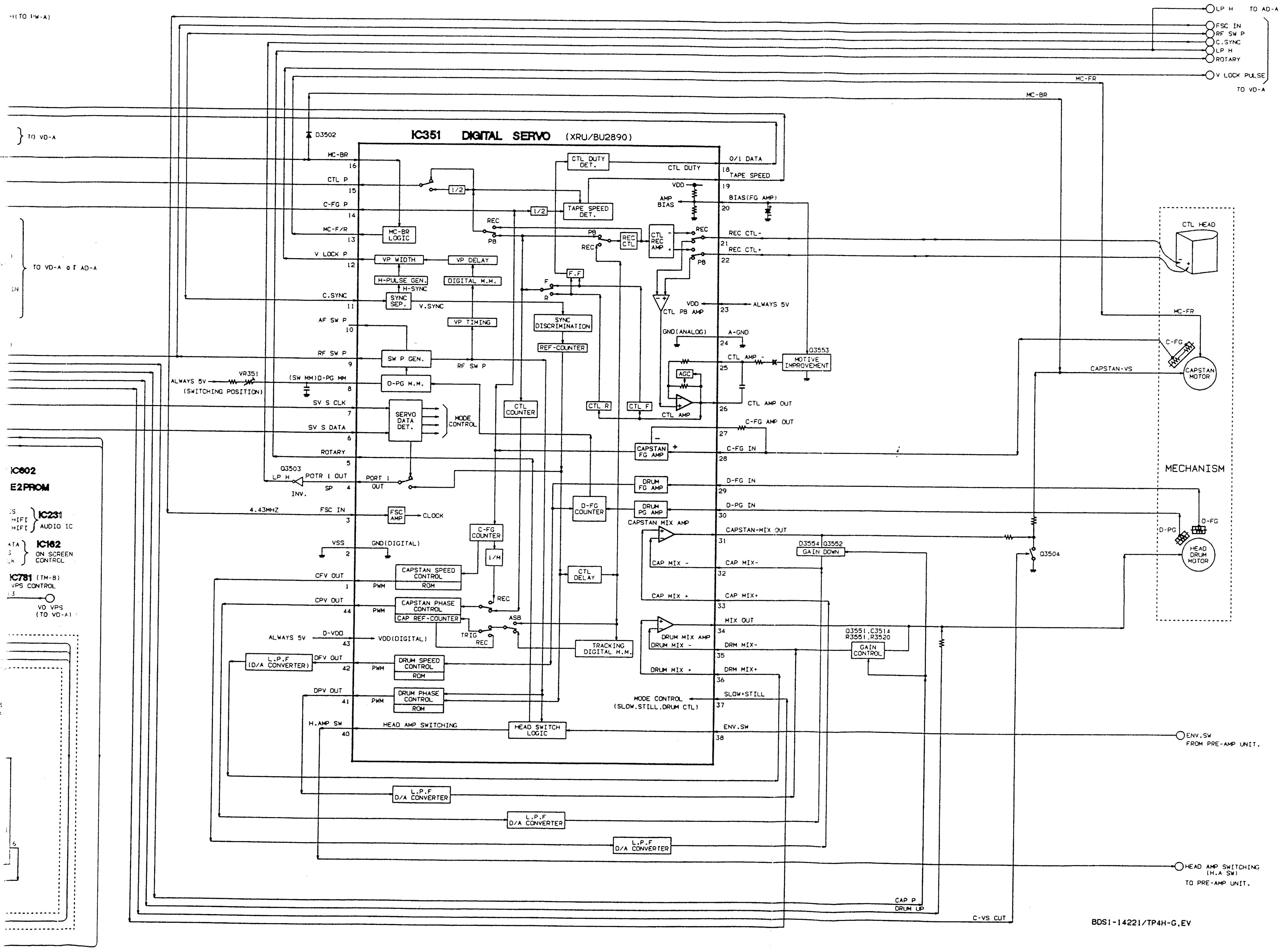

CCD 1H DELAY
IC111 (LC89925)
8.86MHZ CLK
CLOCK DRIVER
565.5bit CCD
CLAMP
VSS
ALWAYS 5V
(REC:YNR , PB:LNC OR DOC)
Q1101,Q1102
L1101,C1104-C1107
3.5MHZ L.P.F
V-LOCK PULSE (TO SV-A)
Q1011
PB 5V
PB LEVEL ADJ.
VR101
VCC
VIDEO Y/C PROCESS
IC101 (LA7345M)
4.2V REG
WHP N.CAN
PB FM IN
PB Y
DOBLE LIMIT
FM DEMOD
SUB L.P.F
MAIN DEEMPHA
Q1002 Q1003
3.5MHZ L.P.F
CLAMP
VCA
1H DL Y
CORR
LIM
K
ATT
3.5MHZ L.P.F.
NOR
DOC
YNR OUT
REC Y
NL DEEMPHA
TO PIN8
WHP N.CAN
PICTURE COTROL
Y/C MIX
PB VIDEO
FBC
VD INSERT VIDEO AMP
EE VIDEO
VIDEO OUTPUT
HALF TONE
Q1622 D1621 D1622
X1621
17.73MHZ
IC162 (LC74760)
ON-SCREEN CONTROL
V IN
CV VIDEO
OSC1
OSC2
SCK
CS
SIN
OSD CLK
OSD CS
OSD DATA
TO IC301
BUFFER
Q1623
Q1601
Q6611 Q6622
VIDEO OUT TO RF UNIT
AV VIDEO OUT (TO TB-1)
DOC DET.
DOC SW
PB/REC DET.
PB/REC SW
AGC CONTROL
AGC DET.
SYNC SEP.
SYNC OUT
C.SYNC
C.CYNC TO SERVO
64B AMP
L.P.F
MAIN EMPHA
NL EMPHA
DETAL EMPHA
W/D CLIP
FM MODURATOR
1/2fH CAR.SHIFT
AGC CTL
VIDEO AGC AMP
AGC VIDEO
EE MONITER VIDEO
EE VIDEO
PB CHROMA
SYNC
HALF H KILLER
BGP GEN.
BGP OUT
BGP1 BGP2
REC Y-FM
SP/LP SW
VIDEO INPUT
REC C
KILLER DET.
ID-DET.
KIL
4PHASE SHIFTER
SUB CONVERTER
629KHZ
4.43MHZ
4.43MHZ fsc
5.6MHZ B.P.F
5.6MHZ
1/2
321fH VCO
SLD
REC AFC
PB APC
X2
8.86MHZ
R1032,R1033 C1036-C1038
321 fH VCO FILTER
GND
ACC DET.
ACC AMP
B.G
BURST EMPHA
MAIN CONVERTER
4.43MHZ B.P.F
MESECAM
PB C (SECAM)
PB C (PAL)
PAL
B.P.F
PB AMP & KILLER
BGP1
BGP2
LP
SP
629KHZ PB C
629KHZ REC C
BALANCER
KILLER
1MHZ L.P.F.
VCC 1
VCC 2
AMP
COMB DRIVER AMP
PAL/SECAM DET.
3RD LOCK PROTECT
REC APC DET.
XO
VXO
Q1313 C1311
VCO CONTROL
S.PLAY
Q1312
APC MUTE
STILL+SLOW
APC FILTER
X1001
4.43MHZ
Q1012
BUFF.
4.43MHZ fsc TO SERVO
Q1151
PB H
ALWAYS 5V
Q1152
PB 5V
DL101
COMB FILTER
L1010,C1058
5.7MHZ TRAP
8DV1-14221/TP4H-G,EV
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

SYSTEM CONTROL & SERVO CIRCUIT



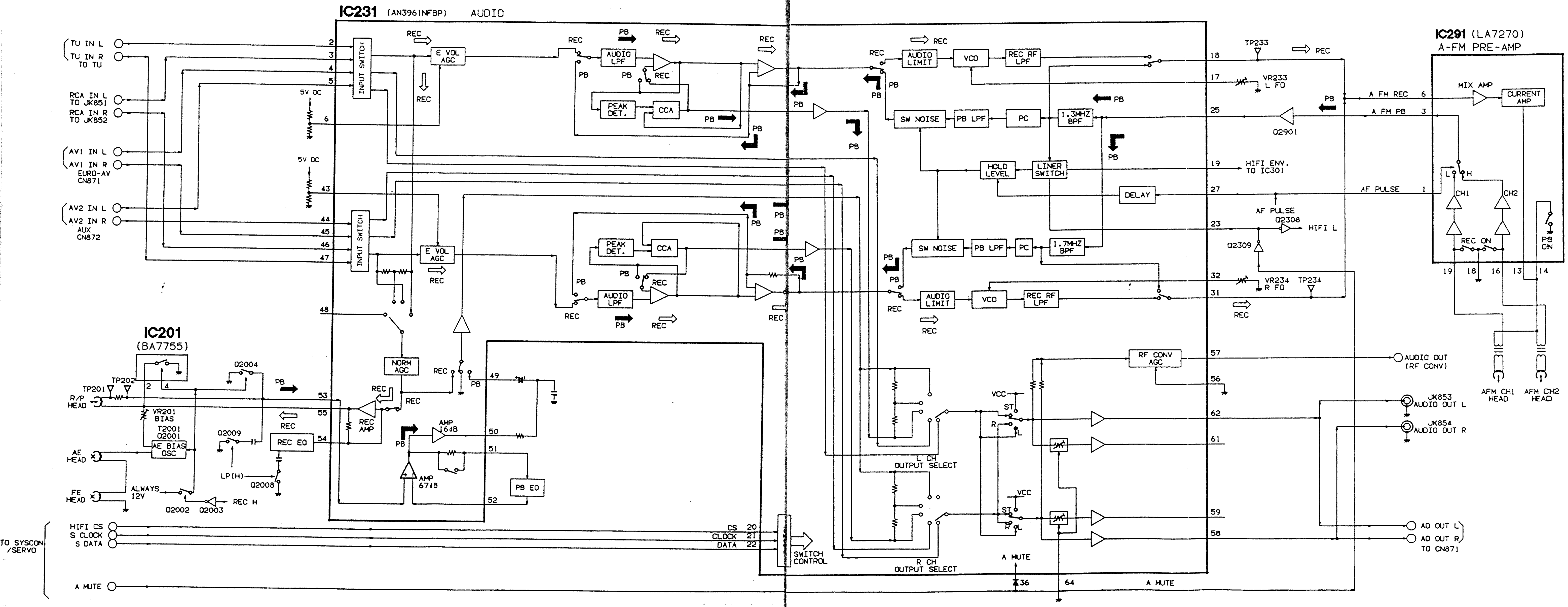
IC301 MPU (CP-1 BOARD)
SYSTEM CONTROL, (LC866648V)
TIMER, TUNING CONTROL
POWER UP
CF1
CF2
CLK1
CLK2
X3001
X3002
ENV.
BACK UP 5V (VDD)
T SPEED
0/1 DATA
ANT/VTR (AV-CTL)
ASO+
MC-BR
CTL P
C-FG P
ML-F
ML-R
ML-L
ML-H
A MUTE
PB H
REC H
NTSC4.43
ISV (FSS IN)
SAFETY SW
STILL+SLOW
W.ASP/AV CTL IN
SW DATA 0-2
S.PLAY
AV1/AV2
T REEL S.
RF SW P
CAP P
DRUM UP
C-VS CUT
SS+DRUM SHIFT
SV.S.CLK
SV.S.DATA
T.TOP-S
T.END-S
FL START SW
S.CLK
I2C S.DATA
ALWAYS -23V
KEY IN 0
KEY IN 1
KEY IN 2
KEY IN 3
S.DATA
OSD CS
POWER DOWN
SEG 1
SEG a
G8
G1
PWM/CE
PLL/S.DATA
PLL CLK
REMOCON
TUNER PWM
H SYNC
BAND 1
BAND 2
AFT MUTE
AFT C
PB-Y IN
ENV DET(VP-1)
BACK UP 5V
IC303
INITIALIZE RESET
IC302
LOADING MOTOR DRIVER
MECHANISM
LOADING MOTOR
ML
D3002
Q3001
D3003
Q3002
ERASE PREVENTION SWITCH
MECHANISM MODE SWITCH
ROTARY SW
TAKE-UP REEL SENSOR
TAPE TOP SENSOR
TAPE END LED
TAPE END SENSOR
FL START SW
OPERATION KEY-MATRIX
KEY IN 0 ~ KEY IN 3
a ~ j (KEY SCAN)
A7101 (TM-1 BOARD)
DISPLAY (FLD)
SEGMENT
G1 ~ G8
GRID
HEATER AC
RR711 (TM-1 BOARD)
IR REMOTE CONTROL RECEIVER
TUNER UNIT.
ANT
IN
TU
UB
HB
LB
CE
CLK
DATA
AFT
IF AGC
<VHR390G ONLY>
Q6921 (TN-A)
R6923-R6927
C6924-C6925
PWM DET.
PWM/CE
IC691 (TN-A)
BAND 1
BAND 2
Q6001
Q6004
AFT SW
<VHR-390G ONLY>
IC631 MTS DECODER
A2
A1
AF1
AF2
SDA
SCL
VR631
SEPA.ADJ
IC632
FM DEMODULATOR
X6301 10MHZ
XF631
XF632
VIDEO OUT(TO VD-A)
A.OUT RCH(TO AD-A)
A.OUT LCH(TO AD-A)
<VHR-390EV ONLY>
POWER UP H (TO PW-A)
ANT/VTR
ASO+
TO VD-A
TO VD-A or AD-A
AV1/AV2 (TO VD-A/AD-A)
C-VS CUT
IC602
E2PROM
IC231
AUDIO IC
HIFI CS
S.CLK HIFI
S.DAT HIFI
IC162
ON SCREEN CONTROL
OSD DATA
OSD CS
OSD CLK
IC781 (TM-8)
VPS CONTROL
VD VPS (TO VD-A)
PLL CS
PLL DATA
PLL CLK
<VHR-390EV ONLY>
Q6901-Q6903
Q6901-Q6904
SYNC DET.
IF-UNIT
SD
A MUTE
AFT C
IF IN
AGC
V.OUT
A.OUT
IF OUT
D3502
IC351 DIGITAL SERVO (XRU/BU2890)
MC-BR
CTL P
C-FG P
MC-F/R
V LOCK P
C.SYNC
AF SW P
RF SW P
ALWAYS 5V
VR351
(SWITCHING POSITION)
(SW MM)D-PG MM
SV S CLK
SV S DATA
ROTARY
Q3503
LP H
POTR 1 OUT
SP
INV.
PORT 1 OUT
4.43MHZ
FSC IN
VSS
GND(DIGITAL)
CFV OUT
CPV OUT
D-VDD
DFV OUT
DPV OUT
H.AMP SW
MC-BR LOGIC
1/2
VP WIDTH
VP DELAY
H-PULSE GEN.
H-SYNC
DIGITAL M.M.
SYNC SEP.
V.SYNC
VP TIMING
SW P GEN.
RF SW P
D-PG M.M.
SERVO DATA DET.
MODE CONTROL
FSC AMP
CLOCK
CAPSTAN SPEED CONTROL
ROM
PWM
CAPSTAN PHASE CONTROL
CAP REF-COUNTER
VDD(DIGITAL)
DRUM SPEED CONTROL
DRUM PHASE CONTROL
HEAD AMP SWITCHING
HEAD SWITCH LOGIC
L.P.F (D/A CONVERTER)
CTL COUNTER
C-FG COUNTER
1/M
REC
ASB
TRIG
CTL DELAY
TRACKING DIGITAL M.M.
D-FG COUNTER
CTL DUTY DET.
CTL DUTY
TAPE SPEED DET.
F.F
SYNC DISCRIMINATION
REF-COUNTER
PB
REC CTL
CTL REC AMP
CTL PB AMP
AMP BIAS
VDD
GND(ANALOG)
AGC
CTL AMP
CTL R
CTL F
CAPSTAN FG AMP
DRUM FG AMP
DRUM PG AMP
CAPSTAN MIX AMP
CAP MIX -
CAP MIX +
DRUM MIX AMP
DRUM MIX -
DRUM MIX +
MODE CONTROL (SLOW,STILL,DRUM CTL)
0/1 DATA
TAPE SPEED
BIAS(FG AMP)
REC CTL-
REC CTL+
ALWAYS 5V
A-GND
CTL AMP -
Q3553
MOTIVE IMPROVEMENT
CTL AMP OUT
C-FG AMP OUT
C-FG IN
D-FG IN
D-PG IN
CAPSTAN-MIX OUT
Q3554
GAIN DOW
CAP MIX-
CAP MIX+
MIX OUT
DRM MIX-
DRM MIX+
SLOW+STILL
ENV.SW
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

SYSTEM CONTROL & SERVO CIRCUIT


(TO PW-A)
TO VD-A
TO VD-A or AD-A
IN
IC602
E2PROM
HIFI
HIFI
IC231
AUDIO IC
IC162
ON SCREEN CONTROL
IC781 (TM-8)
VPS CONTROL
VD VPS
(TO VD-A)
IC351 DIGITAL SERVO (XRU/BU2890)
D3502
MC-BR
16
CTL P
15
C-FG P
14
MC-F/R
13
V LOCK P
12
C.SYNC
11
AF SW P
10
RF SW P
9
ALWAYS 5V
VR351
(SWITCHING POSITION)
(SW MM)D-PG MM
8
SV S CLK
7
SV S DATA
6
ROTARY
5
Q3503
LP H
POTR 1 OUT
SP
4
INV.
PORT 1 OUT
4.43MHZ
FSC IN
3
FSC AMP
CLOCK
VSS
2
GND(DIGITAL)
CFV OUT
1
PWM
CAPSTAN SPEED CONTROL
ROM
CPV OUT
44
CAPSTAN PHASE CONTROL
CAP REF-COUNTER
ALWAYS 5V
D-VDD
43
VDD(DIGITAL)
L.P.F (D/A CONVERTER)
DFV OUT
42
DRUM SPEED CONTROL
ROM
DPV OUT
41
DRUM PHASE CONTROL
ROM
H.AMP SW
40
HEAD AMP SWITCHING
HEAD SWITCH LOGIC
MC-BR LOGIC
VP WIDTH
VP DELAY
H-PULSE GEN.
H-SYNC
DIGITAL M.M.
SYNC SEP.
V.SYNC
VP TIMING
SW P GEN.
RF SW P
D-PG M.M.
SERVO DATA DET.
MODE CONTROL
1/2
1/2
REC
PB
TAPE SPEED DET.
CTL DUTY DET.
CTL DUTY
F.F
F
R
SYNC DISCRIMINATION
REF-COUNTER
CTL COUNTER
CTL R
CTL F
REC CTL
REC
PB
CTL REC AMP
CTL PB AMP
C-FG COUNTER
1/M
REC
ASB
TRIG
REC
D-FG COUNTER
CTL DELAY
TRACKING DIGITAL M.M.
VDD
AMP BIAS
AGC
CTL AMP
GND(ANALOG)
CAPSTAN FG AMP
DRUM FG AMP
DRUM PG AMP
CAPSTAN MIX AMP
CAP MIX -
CAP MIX +
DRUM MIX AMP
DRUM MIX -
DRUM MIX +
MODE CONTROL
(SLOW.STILL.DRUM CTL)
0/1 DATA
18
TAPE SPEED
19
BIAS(FG AMP)
20
REC CTL-
21
REC CTL+
22
VDD
ALWAYS 5V
23
A-GND
24
CTL AMP -
25
Q3553
MOTIVE IMPROVEMENT
CTL AMP OUT
26
C-FG AMP OUT
27
C-FG IN
28
D-FG IN
29
D-PG IN
30
CAPSTAN-MIX OUT
31
Q3554
Q3552
GAIN DOWN
CAP MIX-
32
CAP MIX+
33
MIX OUT
34
Q3551,C3514
R3551,R3520
GAIN CONTROL
DRM MIX-
35
DRM MIX+
36
SLOW+STILL
37
ENV.SW
38
L.P.F D/A CONVERTER
L.P.F D/A CONVERTER
L.P.F D/A CONVERTER
LP H
TO AD-A
FSC IN
RF SW P
C.SYNC
LP H
ROTARY
V LOCK PULSE
TO VD-A
MC-FR
MC-BR
CTL HEAD
MC-FR
C-FG
CAPSTAN-VS
CAPSTAN MOTOR
MECHANISM
D-PG
D-FG
Q3504
HEAD DRUM MOTOR
ENV.SW
FROM PRE-AMP UNIT.
HEAD AMP SWITCHING
(H.A SW)
TO PRE-AMP UNIT.
CAP P
DRUM UP
C-VS CUT

BDS1-14221/TP4H-G,EV

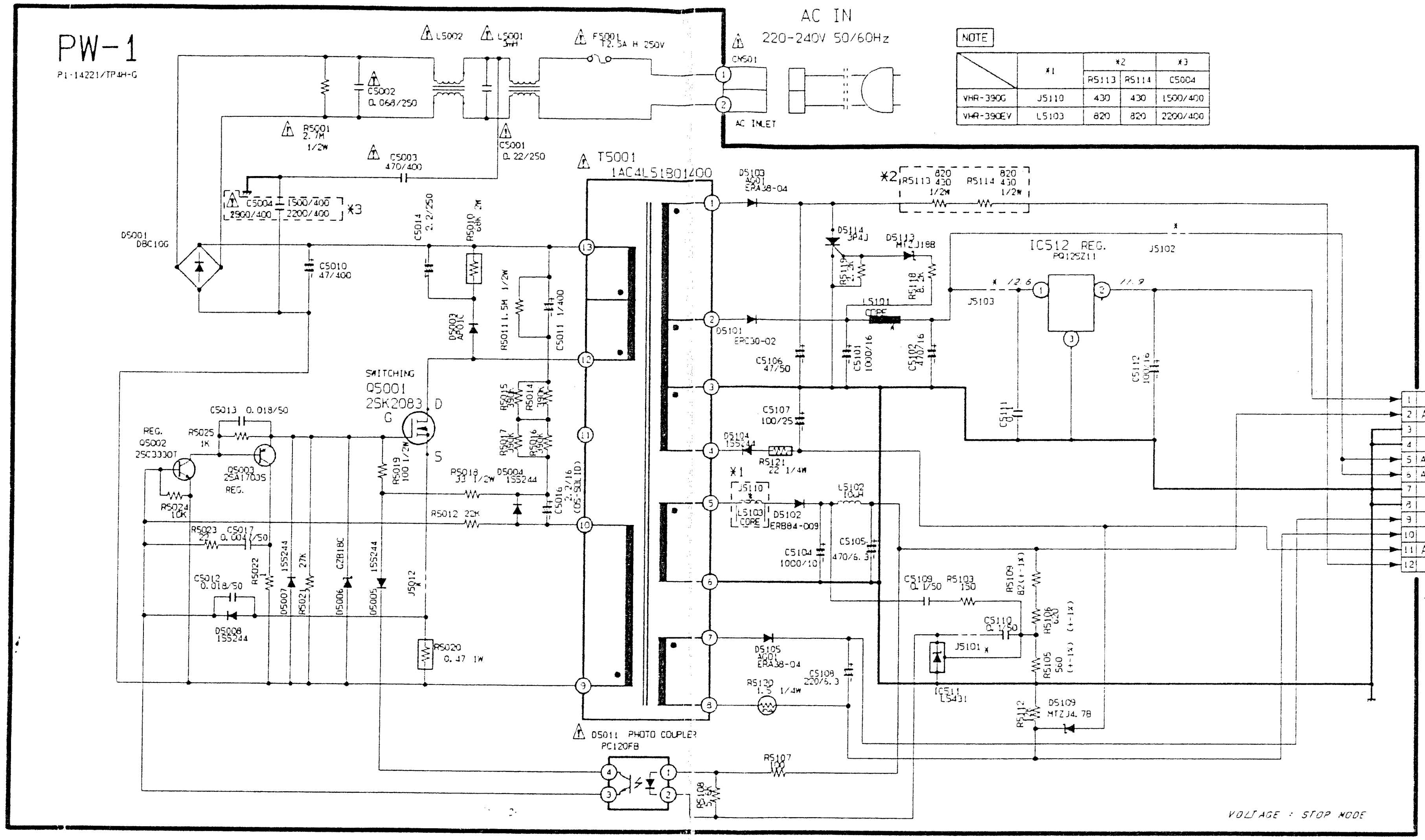
AUDIO CIRCT


IC231 (AN3961NFBP) AUDIO
IC291 (LA7270)
A-FM PRE-AMP
IC201 (BA7755)
TU IN L
TU IN R
TO TU
RCA IN L
TO JK851
RCA IN R
TO JK852
AV1 IN L
AV1 IN R
EURO-AV
CN871
AV2 IN L
AV2 IN R
AUX
CN872
INPUT SWITCH
E VOL AGC
AUDIO LPF
PEAK DET.
CCA
REC
PB
5V DC
NORM AGC
REC AMP
AMP 1648
AMP 6748
PB EQ
REC EQ
AE BIAS OSC
TP201
TP202
R/P HEAD
VR201 BIAS
T2001
Q2001
Q2004
Q2009
LP(H)
Q2008
AE HEAD
FE HEAD
ALWAYS 12V
Q2002
Q2003
REC H
TO SYSCON /SERVO
HIFI CS
S CLOCK
S DATA
A MUTE
CS
CLOCK
DATA
SWITCH CONTROL
AUDIO LIMIT
VCO
REC RF LPF
SW NOISE
PB LPF
PC
1.3MHZ BPF
1.7MHZ BPF
HOLD LEVEL
LINER SWITCH
DELAY
TP233
VR233 L FO
VR234 R FO
TP234
Q2901
HIFI ENV. TO IC301
AF PULSE
Q2308
Q2309
HIFI L
A FM REC
A FM PB
MIX AMP
CURRENT AMP
CH1
CH2
REC ON
PB ON
L
H
L CH OUTPUT SELECT
R CH OUTPUT SELECT
VCC
ST
R
RF CONV AGC
AUDIO OUT (RF CONV)
JK853 AUDIO OUT L
JK854 AUDIO OUT R
AD OUT L
AD OUT R
TO CN871
AFM CH1 HEAD
AFM CH2 HEAD
2
3
4
5
6
43
44
45
46
47
48
49
50
51
52
53
54
55
18
17
25
19
27
23
32
31
57
56
62
61
59
58
20
21
22
36
64
1
3
6
19
18
16
13
14

BDA1-14202/TP4H-G.EV

2. CIRCUIT DIAGRAMS & PRINTED WIRING BOARDS (P.W.B.)

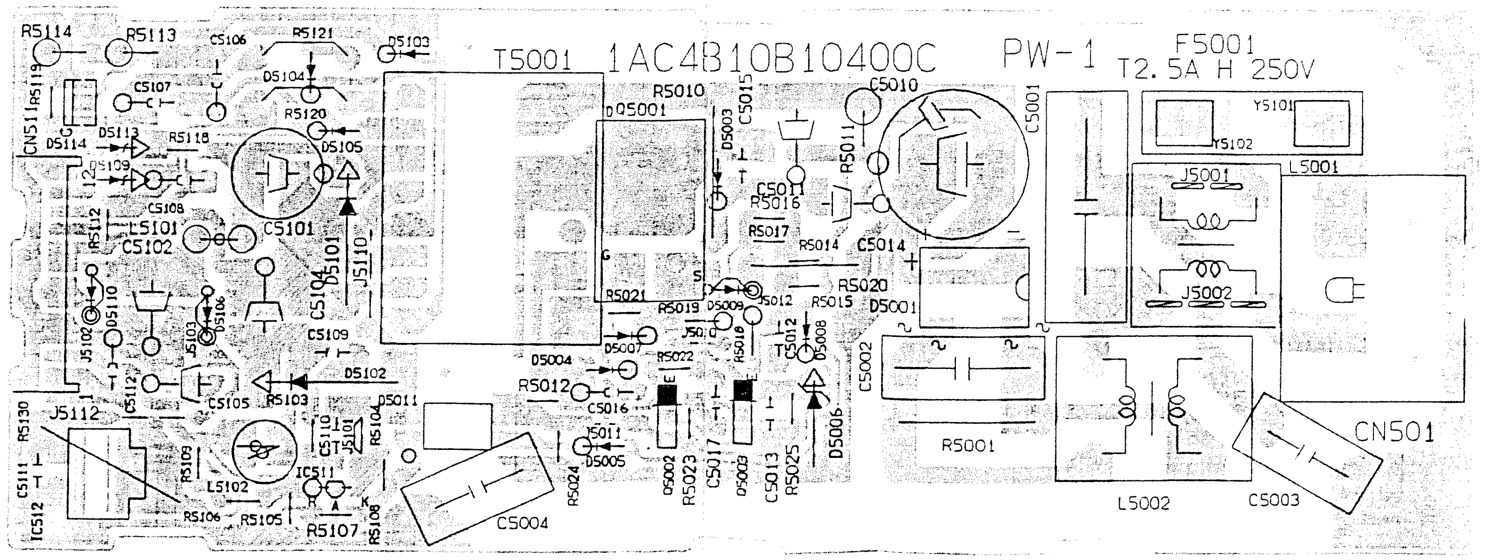
PW-1 BOARD POWER SUPPLY


PW-1
P1-14221/TPAH-G
L5002
L5001
F5001 T2.5A H 250V
AC IN
220-240V 50/60Hz
CN501
AC INLET
C5002 0.068/250
R5001 2.7M 1/2W
C5001 0.22/250
C5003 470/400
C5004 1500/400 2200/400 ✱3
D5001 D8C10G
C5010 47/400
C5014 2.2/250
R5010 68K 2W
R5011 1.5M 1/2W
C5011 1/400
D5002
SWITCHING Q5001 2SK2083
T5001 1AC4LS1B01400
REG. Q5002 2SC3330T
Q5003 2SA1700S REG.
C5013 0.018/50
R5025 1K
R5024 10K
R5023
C5017 0.0047/50
C5012 0.018/50
D5008 1SS244
D5007 1SS244
R5021 27K
D5006 CZ818C
D5005 1SS244
J5012
R5019 100 1/2W
R5018 33 1/2W
D5004 1SS244
R5012 22K
C5016
R5020 0.47 1W
D5011 PHOTO COUPLER PC120FB
R5107
R5108
D5103 ERA38-04
✱2 R5113 820 430 1/2W R5114 820 430 1/2W
D5114
D5113 MTZJ18B
R5118
IC512 REG. PQ12SZ11
J5102
J5103
L5101 CORE
D5101 EPC30-02
C5106 47/50
C5101 1000/16
C5102 470/16
C5112 10/16
C5111
C5107 100/25
D5104 1SS244
R5121 22 1/4W
✱1 J5110 L5103 CORE
D5102 ERB84-009
L5102 10μH
C5104 1000/10
C5105 470/6.3
C5109 0.1/50
R5103 150
R5109 82(1-1%)
C5110 0.1/50
R5108 620
J5101
IC511 LS431
R5105 560
R5112
D5109 MTZJ4.7B
D5105 ERA38-04
C5108 220/6.3
R5120 1.5 1/4W
CN511
1 ALWAYS 12V
2 ALWAYS 5.8V
3 GND
4 GND
5 ALWAYS 13V(MH)
6 ALWAYS 13V(MC)
7 GND(MH)
8 GND(MC)
9 HEATER +
10 HEATER -
11 ALWAYS -23V
12 ALWAYS 32V
TO CP-1(AD-A) CN202
VOLTAGE : STOP MODE

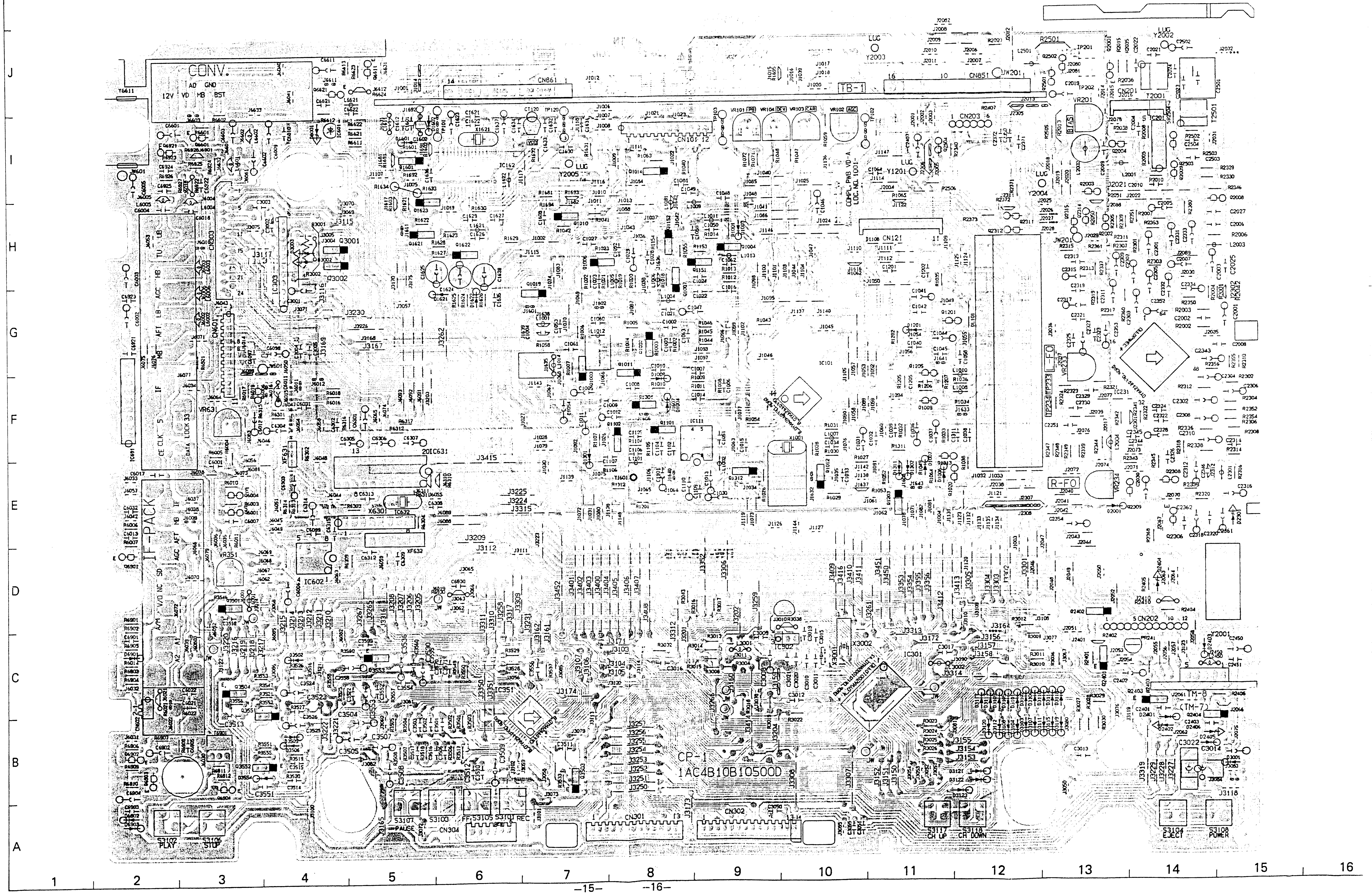
NOTE

	✱1	✱2		✱3
		R5113	R5114	C5004
VHR-390G	J5110	430	430	1500/400
VHR-390EV	L5103	820	820	2200/400

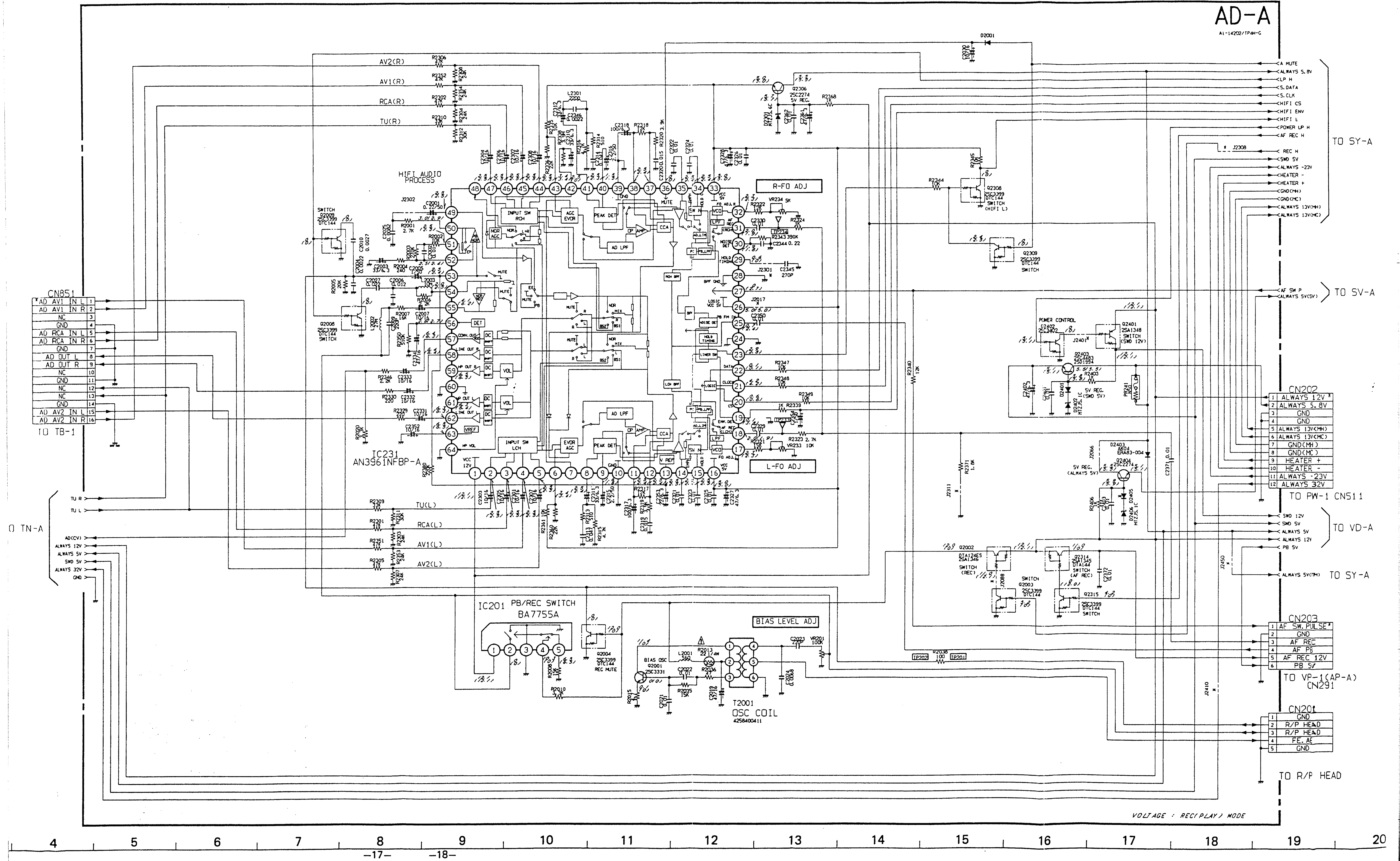
PW-1 P.W.B.


T5001
1AC4B10B10400C
PW-1
F5001
T2.5A H 250V
R5114
R5113
C5106
R5121
D5103
CN511
D5114
C5107
D5104
R5120
D5105
D5113
R5118
C5101
C5108
L5101
C5102
J5110
D5101
C5104
C5109
D5102
R5103
C5105
J5112
R5130
C5111
IC512
L5102
IC511
R5106
R5105
R5107
R5108
R5010
Q5001
D5003
C5015
C5010
C5001
R5011
C5011
R5016
R5017
R5014
C5014
R5020
D5001
R5021
R5019
D5009
J5012
R5015
D5004
D5007
R5022
C5012
D5008
R5012
C5016
C5002
D5011
D5005
R5024
C5004
D5002
R5023
C5017
D5003
C5013
R5025
D5006
R5001
Y5101
Y5102
J5001
J5002
L5001
L5002
C5003
CN501

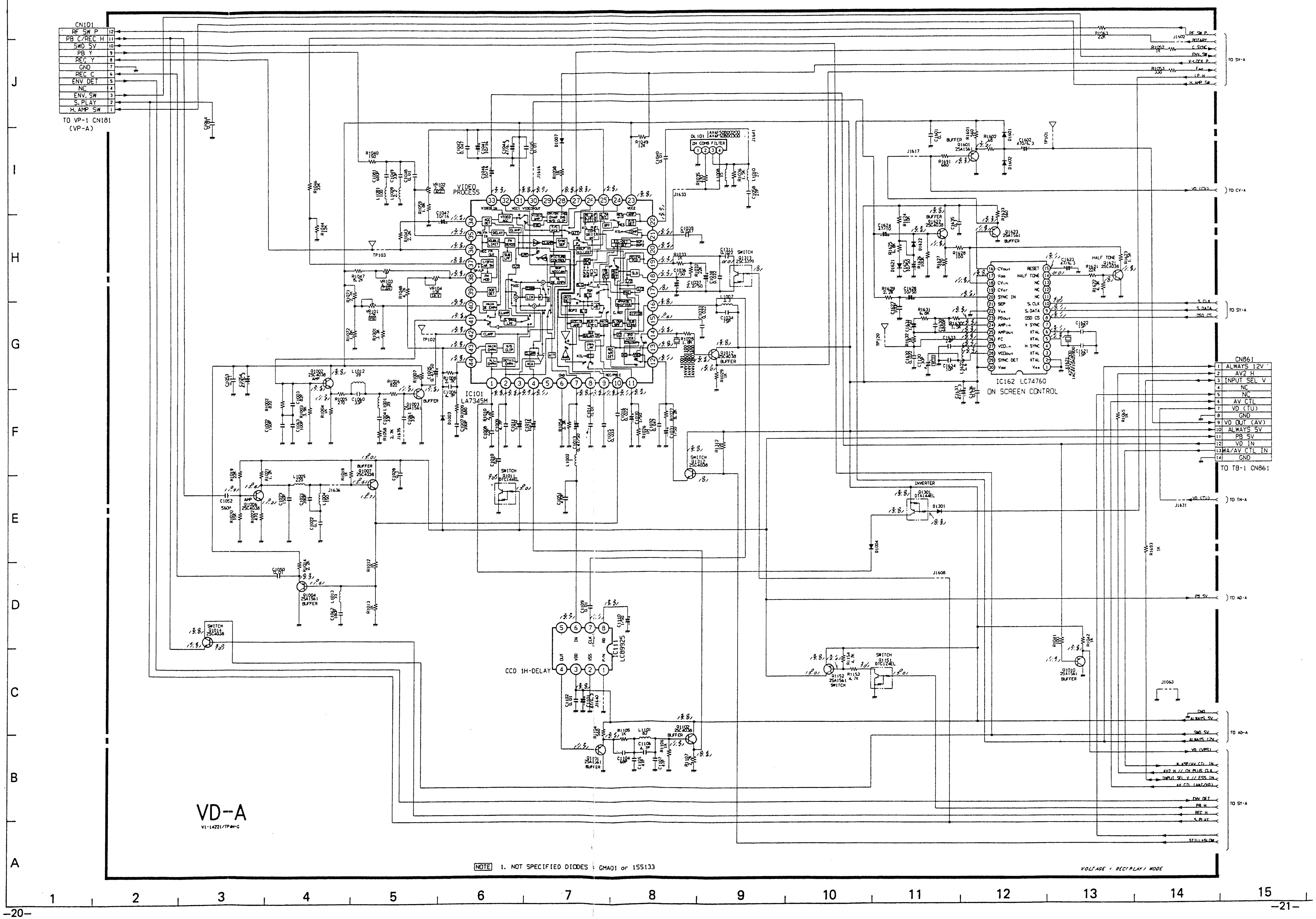
CP-1 P.W.B.


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
CONV.
12V VD MB BST
AD GND
IF-PACK
CN861
CN851
TB-1
CN101
CN121
CN201
CN202
CN203
CN301
CN302
CN304
IC101
IC301
IC351
IC602
IC631
IC632
IC303
IC111
IC902
T2001
T2501
VR201
VR351
VR631
BIAS
L-FO
R-FO
TM-8
TM-7
LUG
CP-1
1AC4B10B10500D
S3102 PLAY
S3106 STOP
S3107 PAUSE
S3103
S3105 FF
S3101 REC
S3111 CH UP
S3110 CH DOWN
S3104 EJECT
S3108 POWER

CP-1 BOARD (AD-A) AUDIO


AD-A
A1-14202/TP4H-G
HIFI AUDIO PROCESS
IC231
AN3961NFBP-A
INPUT SW RCH
INPUT SW LCH
AGC EVOR
EVOR AGC
PEAK DET
OP AMP
CCA
AD LPF
MUTE
NOR AGC
DET
VOL
VREF
HP VOL
NOISE DET
HOLD TIMING
LPF
VCO
R-FO ADJ
L-FO ADJ
VR234 5K
VR233 10K
AV2(R)
AV1(R)
RCA(R)
TU(R)
TU(L)
RCA(L)
AV1(L)
AV2(L)
SWITCH Q2009 2SC3399 DTC144
Q2008 2SC3399 DTC144 SWITCH
Q2306 2SC2274 5V REG.
Q2308 2SC3399 DTC144 SWITCH (HIFI L)
Q2309 2SC3399 DTC144 SWITCH
POWER CONTROL
Q2401 2SA1348 SWITCH (SWD 12V)
Q2403 2SC2483 2SD1994
5V REG. (SWD 5V)
Q2404 2SC2274
5V REG. (ALWAYS 5V)
D2403 AK04 ERA83-004
Q2002 DTA124ES 2SA1346 SWITCH (REC)
Q2314 2SA1345 DTA144 SWITCH (AF REC)
SWITCH Q2003 2SC3399 DTC144
Q2315 2SC3399 DTC144 SWITCH
IC201 PB/REC SWITCH
BA7755A
Q2004 2SC3399 DTC144 REC MUTE
BIAS OSC Q2001 2SC3331
BIAS LEVEL ADJ
T2001
OSC COIL
4258400411
VR201 100K
D2001
J2308
J2450
J2410
J2311
J2066
CN851
*AD AV1 IN L	1
AD AV1 IN R	2
NC	3
GND	4
AD RCA IN L	5
AD RCA IN R	6
GND	7
AD OUT L	8
AD OUT R	9
NC	10
GND	11
NC	12
NC	13
GND	14
AD AV2 IN L	15
AD AV2 IN R	16
TO TB-1
TU R
TU L
AD(CV)
ALWAYS 12V
ALWAYS 5V
SWD 5V
ALWAYS 32V
GND
0 TN-A
A MUTE
ALWAYS 5.8V
LP H
S.DATA
S.CLK
HIFI CS
HIFI ENV
HIFI L
POWER UP H
AF REC H
REC H
SWD 5V
ALWAYS -23V
HEATER -
HEATER +
GND(MH)
GND(MC)
ALWAYS 13V(MH)
ALWAYS 13V(MC)
TO SY-A
AF SW P
ALWAYS 5V(SV)
TO SV-A
CN202
1	ALWAYS 12V *
2	ALWAYS 5.8V
3	GND
4	GND
5	ALWAYS 13V(MH)
6	ALWAYS 13V(MC)
7	GND(MH)
8	GND(MC)
9	HEATER +
10	HEATER -
11	ALWAYS -23V
12	ALWAYS 32V
TO PW-1 CN511
SWD 12V
SWD 5V
ALWAYS 5V
ALWAYS 12V
PB 5V
TO VD-A
ALWAYS 5V(TM)
TO SY-A
CN203
1	AF SW.PULSE*
2	GND
3	AF REC
4	AF PB
5	AF REC 12V
6	PB 5V
TO VP-1(AP-A)
CN291
CN201
1	GND
2	R/P HEAD
3	R/P HEAD
4	FE. AE
5	GND
TO R/P HEAD
VOLTAGE : REC(PLAY) MODE
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

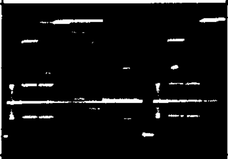
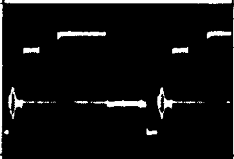
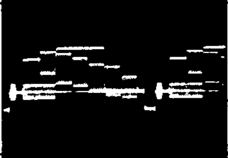
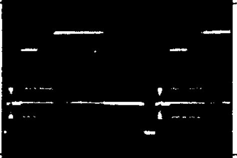
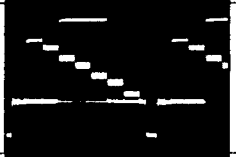
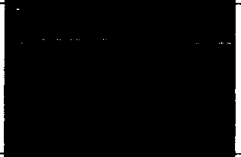
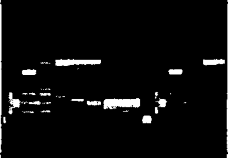
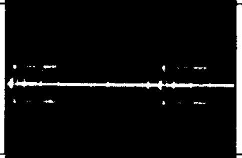
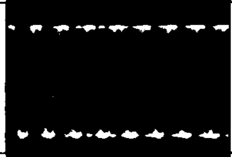
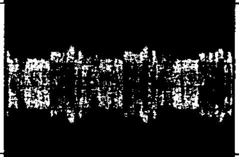
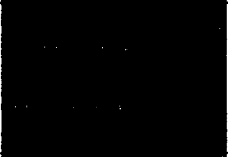
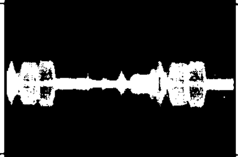
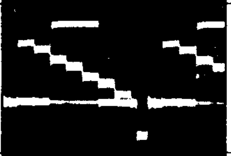
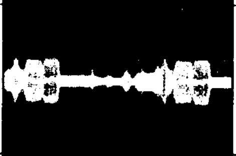
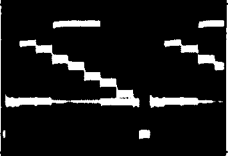
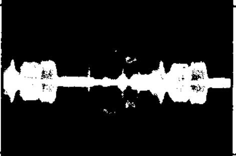
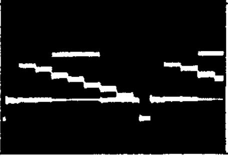
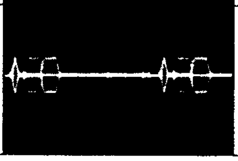
CP-1 BOARD (VD-A) VIDEO


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
CN101
RF SW P 12
PB C/REC H 11
SWD 5V 10
PB Y 9
REC Y 8
GND 7
REC C 6
ENV DET 5
NC 4
ENV. SW 3
S.PLAY 2
H. AMP SW 1
TO VP-1 CN181
(VP-A)
VIDEO PROCESS
IC101
LA7345M
2H COMB FILTER
DL101
IC162 LC74760
ON SCREEN CONTROL
CCD 1H-DELAY
IC111
LC89925
CN861
1 ALWAYS 12V
2 AV2 H
3 INPUT SEL V
4 NC
5 NC
6 AV CTL
7 VD (TU)
8 GND
9 VD OUT (AV)
10 ALWAYS 5V
11 PB 5V
12 VD IN
13 WA/AV CTL IN
14 GND
TO TB-1 CN861
TO SY-A
TO CV-A
TO TN-A
TO AD-A
INVERTER
SWITCH
BUFFER
AMP
HALF TONE
VD-A
VOLTAGE : REC/PLAY/ MODE

NOTE 1. NOT SPECIFIED DIODES : GMA01 or 1SS133

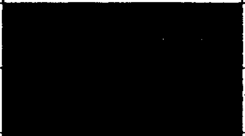
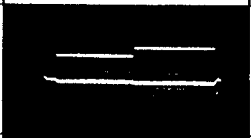
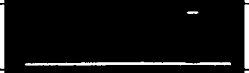
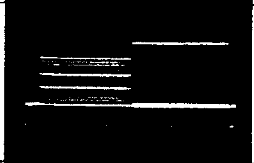
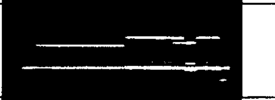
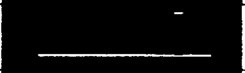
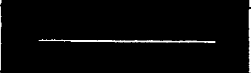
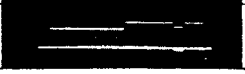
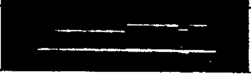
VIDEO CIRCUIT WAVEFORMS

WF-V-TP

TEST LOCATION	WAVEFORM	MODE/LEVEL	TEST LOCATION	WAVEFORM	MODE/LEVEL
IC101 Pin 33 (VIDEO IN)		REC, EE 1 Vp-p	IC101 Pin 30 (VIDEO OUT)		PB 2.5 Vp-p
IC101 Pin 41		REC, EE 0.6 Vp-p	IC101 Pin 30 (VIDEO OUT)		REC, EE 2 Vp-p
IC101 Pin 42		REC, EE 0.5 Vp-p	IC101 (UPPER) Pin 30 (LOWER) Pin 28		STILL (UPPER) 2 Vp-p (LOWER) 5 Vp-p
IC101 Pin 43		REC, EE 1.2 Vp-p	IC101 Pin 10 (REC CHROMA OUT)		REC, EE 0.4 Vp-p
IC101 Pin 36 (REC FM OUT)		REC, EE 1.0 Vp-p	Q1006 Base (PB CHROMA)		PB 0.3 Vp-p
IC101 Pin 35 (PB FM IN)		PB 0.3 Vp-p	Q1007 Emitter (PB CHROMA)		PB 0.2 Vp-p
IC101 Pin 41		PB 0.5 Vp-p	IC101 Pin 10 (PB CHROMA IN)		PB 0.2 Vp-p
IC101 Pin 42		PB 0.5 Vp-p	IC101 Pin 20		PB 1.0 Vp-p
IC101 Pin 7/4		PB 0.3 Vp-p	IC101 Pin 26		PB 0.6 Vp-p

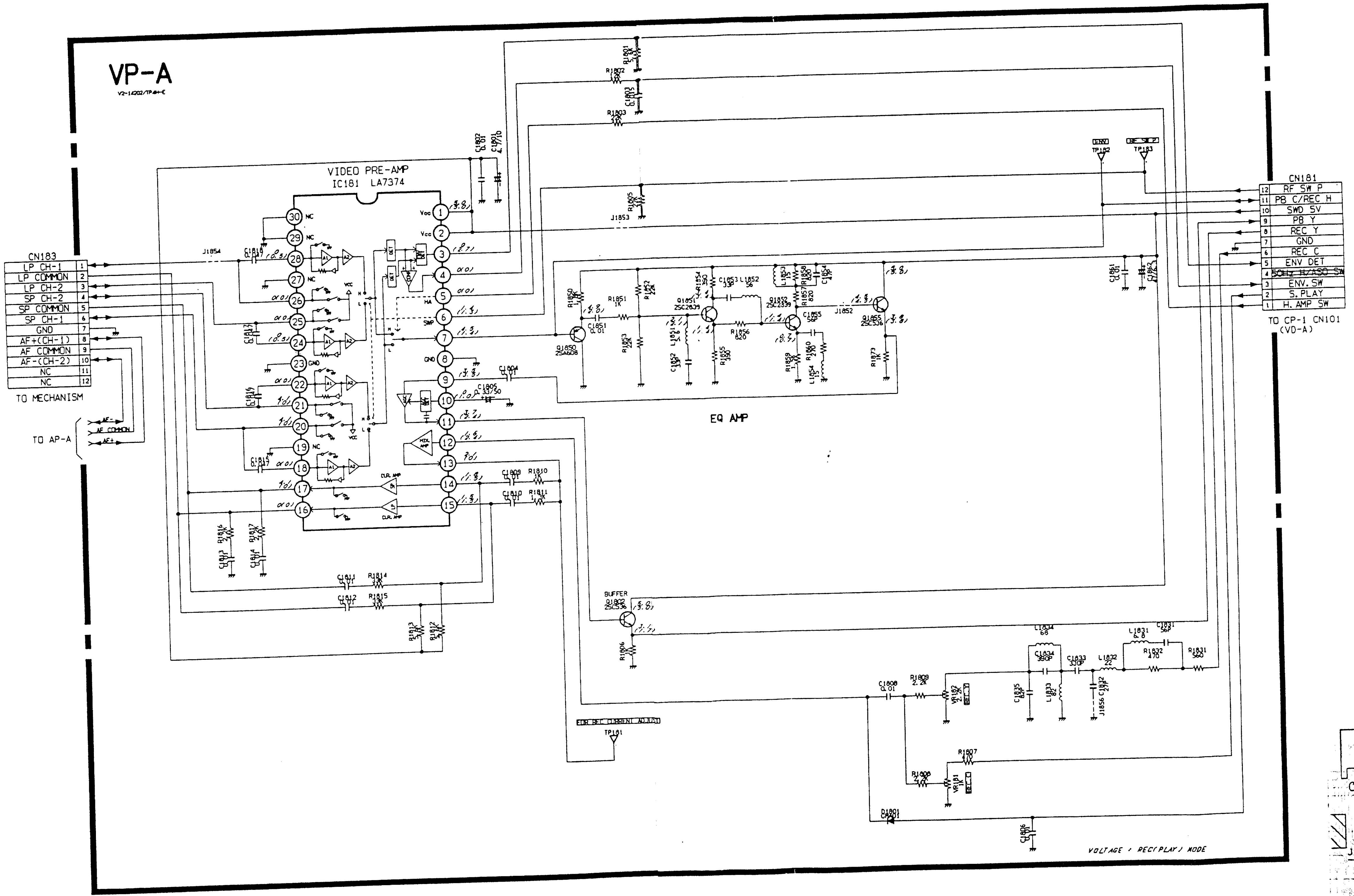
ON SCREEN (IC162) WAVEFORMS

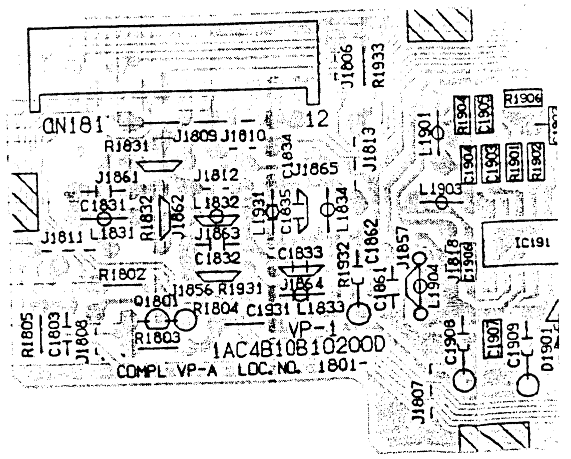
(MODE: REC EE/ON SCREEN)

TEST LOCATION	WAVEFORM	LEVEL	TEST LOCATION	WAVEFORM	LEVEL
Pin 5 (17.7MHz X-TAL)		2Vp-p	Pin 19 (CV cr)		2Vp-p
Pin 6 (17.7MHz X-TAL)		3Vp-p			
Pin 14 (HALF TONE)		5Vp-p	Pin 20 (SYNC IN)		2Vp-p
Pin 16 (VIDEO OUT: WITH ON SCREEN)		2Vp-p			
Pin 14 (HALF TONE)		5Vp-p	Pin 23 (PD OUT)		4.5Vp-p
Pin 18 (VIDEO IN)		2Vp-p	Pin 16 (VIDEO OUT)		2Vp-p

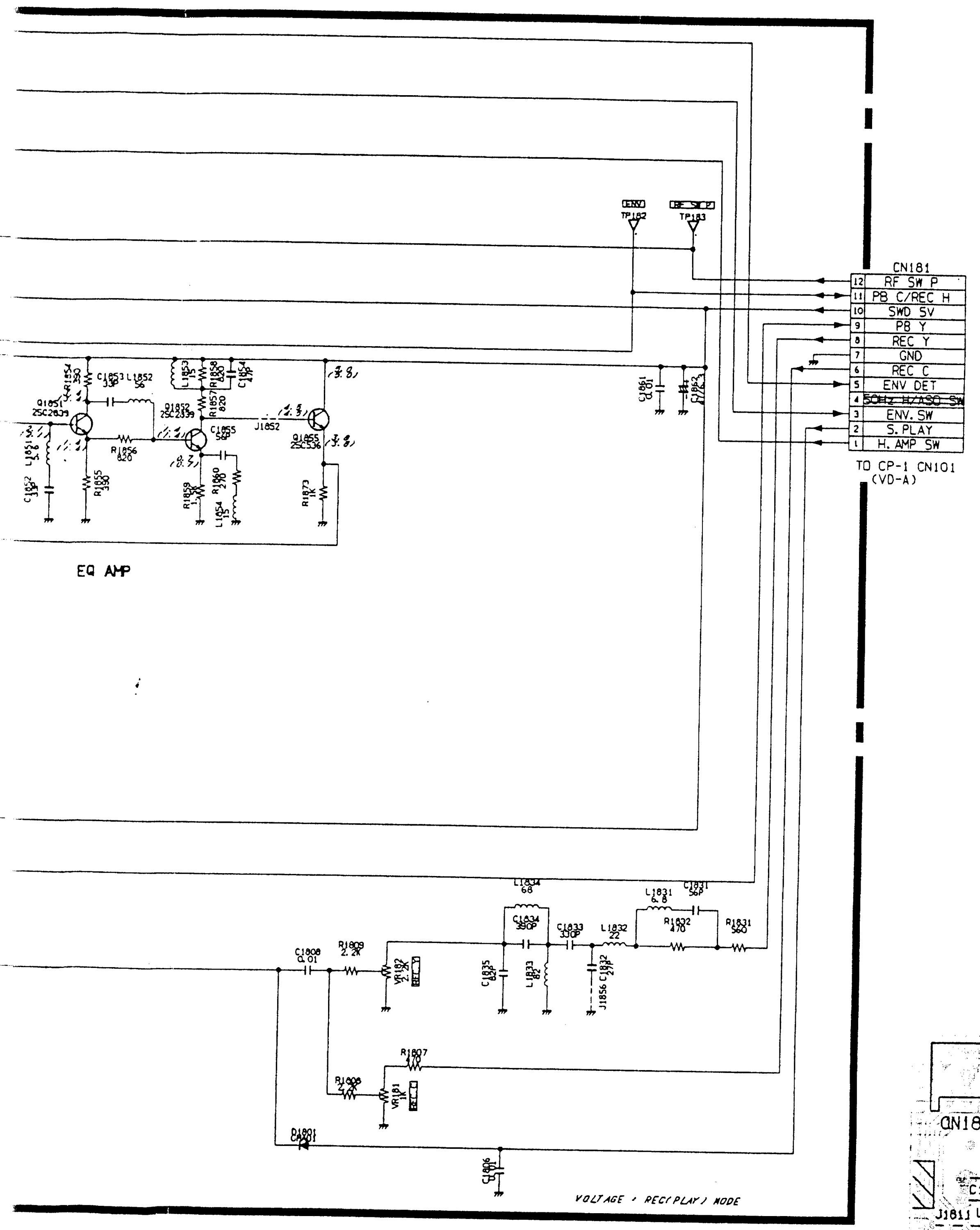
WF-UFO-TP4

VP-1 BOARD (VP-A) VIDEO PRE-AMP

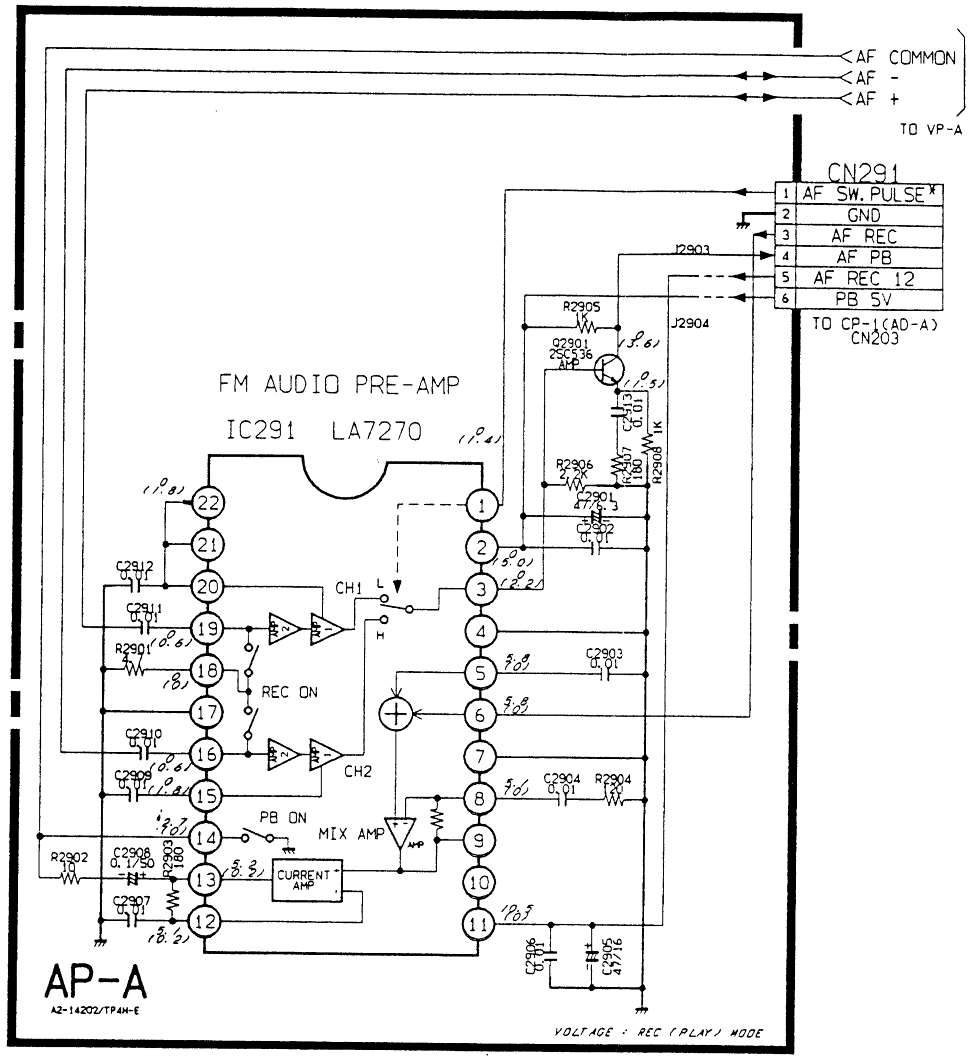

VP-A
VIDEO PRE-AMP
IC181 LA7374
CN183
1 LP CH-1
2 LP COMMON
3 LP CH-2
4 SP CH-2
5 SP COMMON
6 SP CH-1
7 GND
8 AF+(CH-1)
9 AF COMMON
10 AF-(CH-2)
11 NC
12 NC
TO MECHANISM
TO AP-A
AF-
AF COMMON
AF+
CN181
12 RF SW P
11 PB C/REC H
10 SWD SV
9 PB Y
8 REC Y
7 GND
6 REC C
5 ENV DET
4 50Hz H/ASO SW
3 ENV. SW
2 S. PLAY
1 H. AMP SW
TO CP-1 CN101
(VD-A)
ENV
TP182
RF SW P
TP183
EQ AMP
BUFFER
Q1802
2SC536
FOR REC CURRENT ADJUST
TP181
D1801
VOLTAGE (REC/PLAY) MODE


CN181
12
VP-1
1AC4B10B10200D
COMPL VP-A LOC. NO. 1801
IC191

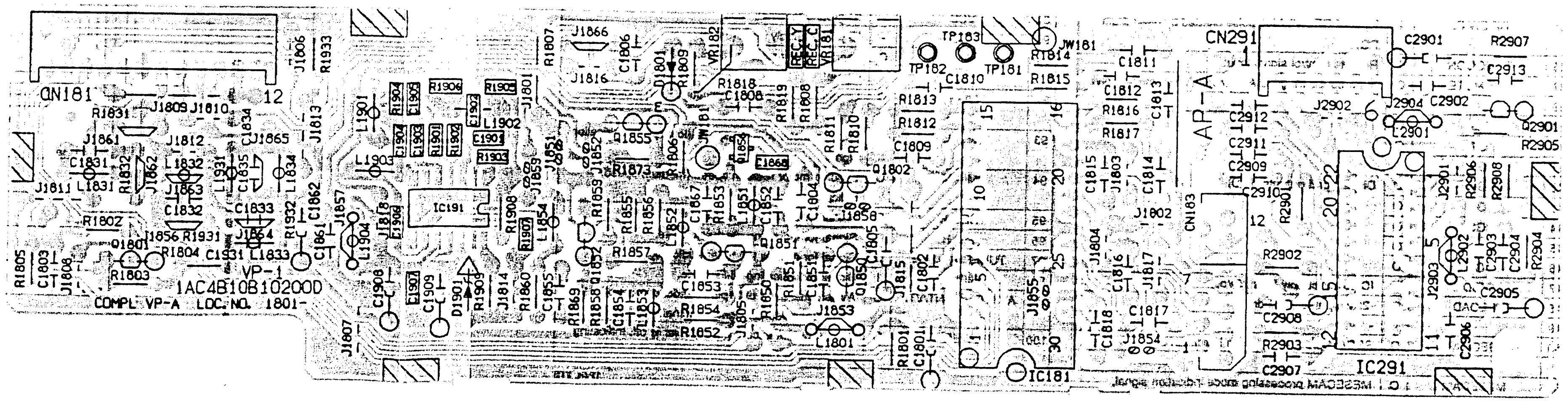
P-A) VIDEO PRE-AMP


CN181
12 RF SW P
11 PB C/REC H
10 SWD 5V
9 PB Y
8 REC Y
7 GND
6 REC C
5 ENV DET
4 50Hz H/ASO SW
3 ENV. SW
2 S. PLAY
1 H. AMP SW
TO CP-1 CN101 (VD-A)
TP182
TP183
Q1851 2SC2839
Q1852 2SC2839
Q1855 2SA
EQ AMP
VOLTAGE : REC(PLAY) MODE

VP-1 BOARD (AP-A) AUDIO PRE-AMP


AF COMMON
AF -
AF +
TO VP-A
CN291
1 AF SW. PULSE
2 GND
3 AF REC
4 AF PB
5 AF REC 12
6 PB 5V
TO CP-1 (AD-A) CN203
J2903
J2904
R2905
Q2901 2SC2236
FM AUDIO PRE-AMP
IC291 LA7270
CH1
CH2
REC ON
PB ON
MIX AMP
CURRENT AMP
AP-A
VOLTAGE : REC (PLAY) MODE

VP-1 P.W.B.


CN181
CN291
IC191
IC181
IC291
TP181
TP182
TP183
AP-A
VP-1
1AC4B10B10200D
COMPL VP-A LOC. NO. 1801-

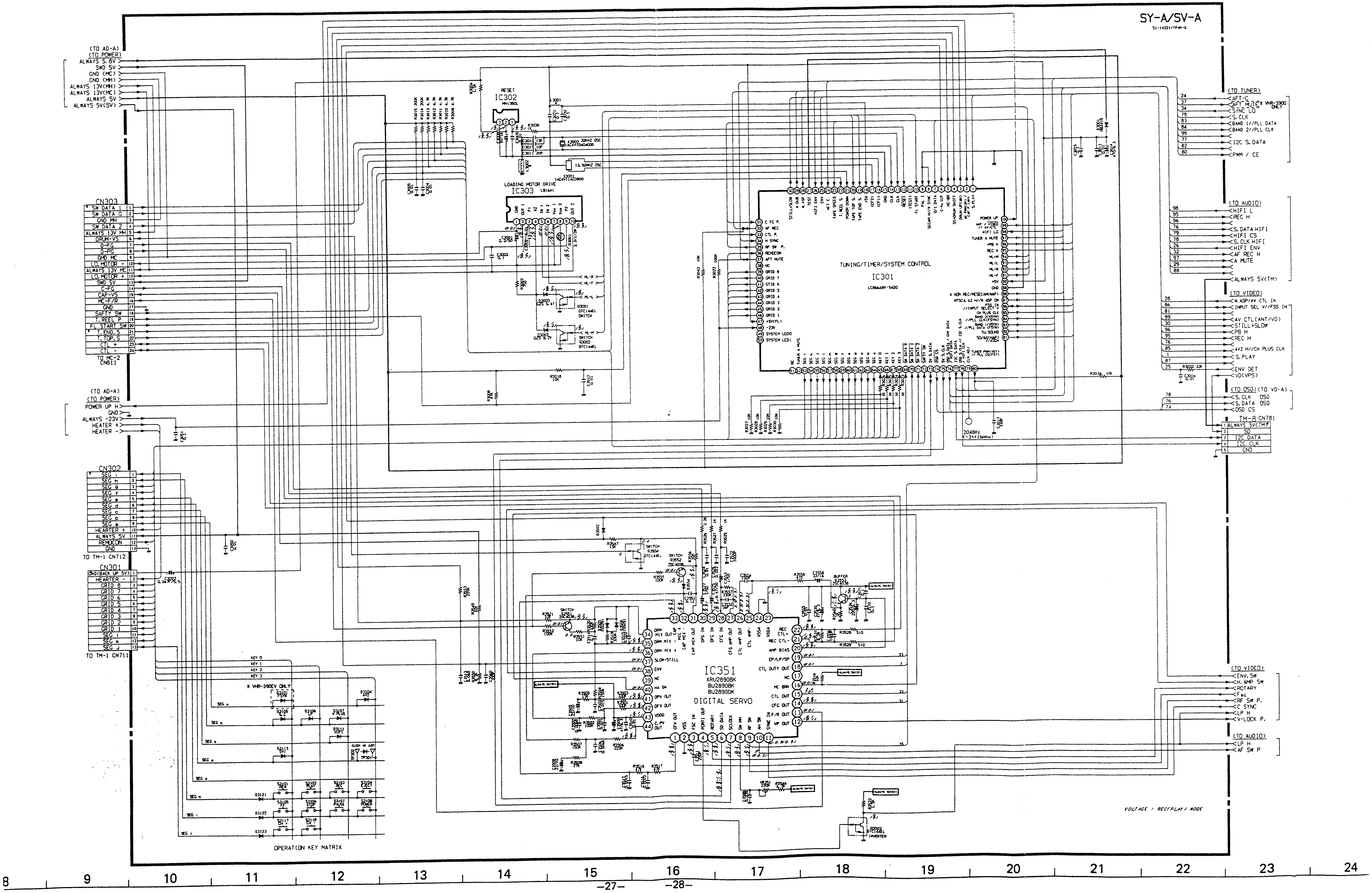
IC301 SYSTEM CONTROL,TIMER, & TUNING CONTROL MPU PIN FUNCTIONS TABLE

No.	Name	I/O	I/O Signal Function
1	S - PLAY	O	Signal for indicating CUE , REV , STILL and SLOW modes.
2	4k - PWM	O	Output 4kHz PWM signal for set period at start of high-speed FF / REW. (For 2 Haed model)
	CAP P.	O	Gain down control for Head Motor Amplifier at SLOW mode. (For 4 Head model)
3	DRUM UP	O	Head drum motor rotation speed - up signal.
4	SS + DRUM SHIFT	O	Signal for indicating SLOW/STILL modes and alternation of drum motor control data. (3 value voltage)
5	MC - BR	O	Brake signal for capstan motor.
6	C - Vs CUT	O	Cut off for capstan motor control voltage in SLOW / STILL modes.
7	0 / 1 DATA	I	CTL pulse duty detection signal input. Used for VISS detection.
8	V SYNC	I	V-sync input for TV system (50/60) discrimination.
9	PAL L	I	PAL-TV system indication signal input.
10	FL- START SW	I	Switch input indicating start of cassette loading or discharge by cassette mechanism.
11	-	-	-
12	RESET	I	Initial reset terminal for this IC.
13	CLK	-	Clock OSC during power failures.
14	CLK	-	Frequency is 32kHz.
15	VSS	-	Ground terminal
16	CF1	-	IC clock OSC terminal.
17	CF2	-	Frequency is 13.92MHz.
18	VDD	-	IC power supply terminal.(5Vdc)
19	T. END S.	I	Sensor signal input for tape end detection.
20	T. TOP S.	I	Sensor signal input for tape beginning detection.
21	POWER DOWN	I	Power failure detection terminal.
22	T. REEL S.	I	Pulse input for detection of take-up reel table rotation.
23	TAPE SPEED	I	Input of result of tape speed discrimination by digital servo IC.
24	AFT- C	I	Tuner AFT s-curve signal input for tuner AFT function.
25	ENV.	I	Video head envelope detection signal input for ATR function.
26	Hi-Fi ENV.	I	Audio head envelope detection signal for ATR .
27	-	-	-
28	WIDE ASPECT IN	I	Wide aspect video system indication signal input.
29	A DUB	O	Signal for disable the full erase oscillation.
30	SLOW + STILL	O	SLOW or STILL modes indication signal.
31	C - FG P.	I	FG signal input of capstan motor.
32	AF REC	O	Signal for indicate the recording start of audio signal at insert mode.
33	CTL P.	I	CTL head recording / playback pulse signal input.
34	H SYNC (LEVEL)	I	Sync. detecton signal input for existing channel discrimination.
35	RF SW P.	I	Input of RF switching pulse created by head drum PG.
36	REMOCON	I	Remote control signal input.
37	AFT MUTE	O	"H" output during TU AFT mute. (V-syn model only)
38	-	-	-
39	G8	O	Display grid outputs (FLD).
40	G7	O	
41	G6	O	
42	G5	O	
43	G4	O	
44	G3	O	
45	G2	O	
46	G1	O	
47	VDD	-	IC power supply input.(5Vdc)
48	V LOAD	O	-23V input for FLD drive.
49	-	-	-
50	SECAM	O	SECAM processing mode indication signal.
51	-	-	-
52	MESECAM	O	MESECAM processing mode indication signal.

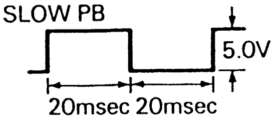
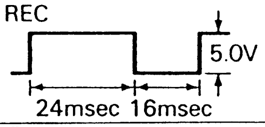
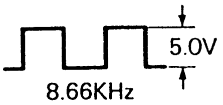
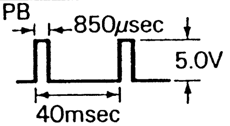
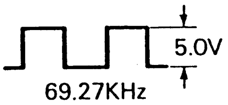
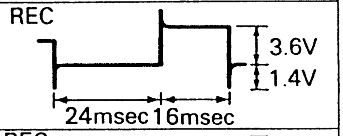
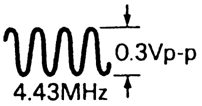
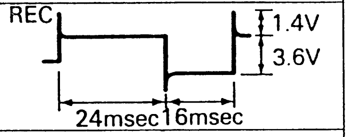
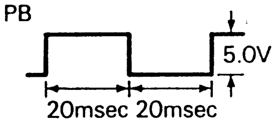
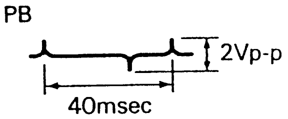
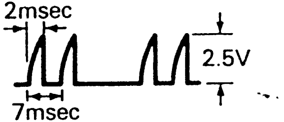
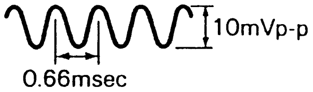
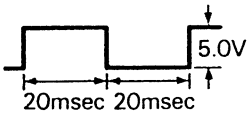
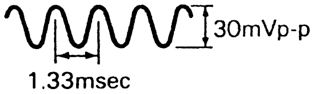
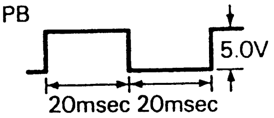
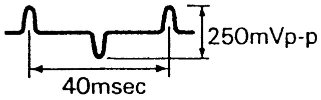
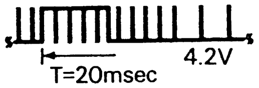
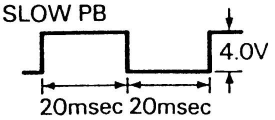
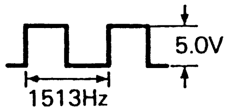
No.	Name	I/O	I/O Signal Function
53	SEG l	O	Display segment outputs (FLD). (Includes key-scan output)
54	SEG k	O	
55	SEG j	O	
56	SEG i	O	
57	SEG h	O	
58	SEG g	O	
59	SEG f	O	
60	SEG e	O	
61	SEG d	O	
62	SEG c	O	
63	SEG b	O	
64	SEG a	O	
65	KEY IN 0	I	Operation key data inputs.
66	KEY IN 1	I	
67	KEY IN 2	I	
68	KEY IN 3	I	
69	SW DATA 0	I	3-bit data indicating operation position of mechanism.
70	SW DATA 1	I	
71	SW DATA 2	I	
72	SAFETY SW	I	Terminal for accidental erasure prevention switch. No operation to recording mode while "LOW" is input.
73	SV S. DATA	O	Output 8-bit X 4 serial data giving operation mode and tracking data,etc., to digital servo IC.
74	OSD CS	O	Chip enable (access) signal output to OSD IC.
75	SV S CLK	O	The clock pulse for digital servo IC.
76	COMMON DATA	I/O	Terminal for communication of respective data with OSD IC, audio IC, and CH+ I/O selection IC.
77	I2C SDA	I/O	Data exchange with tuning data memory (I2C) IC.
78	COMMON CLK	O	The clock pulse for OSD IC, I2C IC, and audio IC.
79	CLK ADJ	-	1024 Hz signal for clock time adjustment.
80	PLL CS	O	Chip enable signal output to PLL tuning system IC. (F-syn model)
	PWM	O	Tuning voltage output (PWM signal). (V-syn model)
81	ASO +	O	Video picture quality selection signal.
82	TU SOUND	O	TV sound system (I/BG, I/DK etc.) indication.
83	PLL DATA	O	Data exchange with PLL tuning system IC.(For F-syn)
	BAND 1	O	Tuning band data output (BAND 1/BAND 2). (L,L)=VHF-LOW (L,H)=VHF-HIGH (H,L)=UHF (H,H)=SKIP. (For V-syn. model)
84	BAND 2	O	
	PLL CLK	O	The clock pulse for PLL tuning system IC.(For F-syn)
85	CH PLUS CLK	O	The clock pulse for CH+ input/output selection IC. (For CH + model only)
	AV 1 / AV 2	O	External input source (AV 1/2) selection signal.
86	INPUT SEL. V	O	Video input source (TU/AV) selection signal.
	FSS IN	I	CH + mode indication signal. (For CH + model only)
87	WIDE ASPECT ON	O	Video wide aspect system selection signal.
88	A NOR REC	O	Signal for indicate the full erase oscillation.
89	VSS	-	IC ground terminal.
90	VDD	-	IC power supply input.(5Vdc)
91	ML- F	O	Loading motor rotation direction (FWD) indication signal.
92	ML- R	O	Loading motor rotation direction (REV) indication signal.
93	ML- L	O	Loading motor rotation speed (low speed) indication signal.
94	ML- M	O	Loading motor rotation speed (medium speed) indication signal.
95	REC H	O	Signal for indicating recording mode.
96	PB H	O	Signal for indicating playback mode.
97	TUNER A MUTE	O	Signal for disable the tuner audio signal.
98	HIFI LO	I	Signal for indicating Hi-Fi mode.
99	AV CTL or ANT/VTR	O	AV terminal (pin8 of 21pin AV socket) control or the ANT/VTR selection signal terminal.
100	POWER UP	O	"HIGH" output except when power is off. Indicating that power is ON.

TP4H_TTS

CP-1 BOARD (SY-A,SV-A) SYSTEM CONTROL & SERVO


SY-A/SV-A
(TO AD-A)
(TO POWER)
ALWAYS 5.8V
SWD 5V
GND (MC)
GND (MH)
ALWAYS 13V(MH)
ALWAYS 13V(MC)
ALWAYS 5V
ALWAYS 5V(SV)
RESET
IC302
LOADING MOTOR DRIVE
IC303 LB1641
CN303
SW DATA 1
SW DATA 0
GND MH
SW DATA 2
ALWAYS 13V MH
DRUM-VS
D-FG
D-PG
GND MC
LD. MOTOR -
ALWAYS 13V MC
LD. MOTOR +
SWD 5V
C-FG
CAP-VS
MC-F/R
GND
SAFTY SW
T. REEL P
FL START SW
T. END. S
T. TOP. S
CTL +
CTL -
TO MC-2 CN811
(TO AD-A)
(TO POWER)
POWER UP H
GND
ALWAYS -23V
HEATER +
HEATER -
CN302
SEG i
SEG h
SEG g
SEG f
SEG e
SEG d
SEG c
SEG b
SEG a
HEARTER +
ALWAYS 5V
REMOCON
GND
TO TM-1 CN712
CN301
GND(BACK UP 5V)
HEARTER -
GRID 8
GRID 7
GRID 6
GRID 5
GRID 4
GRID 3
GRID 2
GRID 1
SEG l
SEG k
SEG j
TO TM-1 CN711
TUNING/TIMER/SYSTEM CONTROL
IC301
LC866448V-5420
IC351
XRU2890BK
BU2890BK
BU2890GK
DIGITAL SERVO
(TO TUNER)
AFT-C
AFT MUTE
SYNC LD
S. CLK
BAND 1//PLL DATA
BAND 2//PLL CLK
I2C S. DATA
PWM / CE
(TO AUDIO)
HIFI L
REC H
S. DATA HIFI
HIFI CS
S. CLK HIFI
HIFI ENV
AF REC H
A MUTE
ALWAYS 5V(TM)
(TO VIDEO)
H. ASP/AV CTL IN
INPUT SEL V//PSS IN
AV CTL(ANT/VD)
STILL+SLOW
PB H
REC H
AV2 H//CH PLUS CLK
S. PLAY
ENV DET
VD(VPS)
(TO OSD)(TO VD-A)
S. CLK OSD
S. DATA OSD
OSD CS
TM-8 CN781
ALWAYS 5V(TM)
SD
I2C DATA
I2C CLK
GND
2048Hz
(TO VIDEO)
ENV. SW
H. AMP SW
ROTARY
F sc
RF SW P.
C SYNC
LP H
V-LOCK P.
(TO AUDIO)
LP H
AF SW P
OPERATION KEY MATRIX
VOLTAGE : REC(PLAY) MODE
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

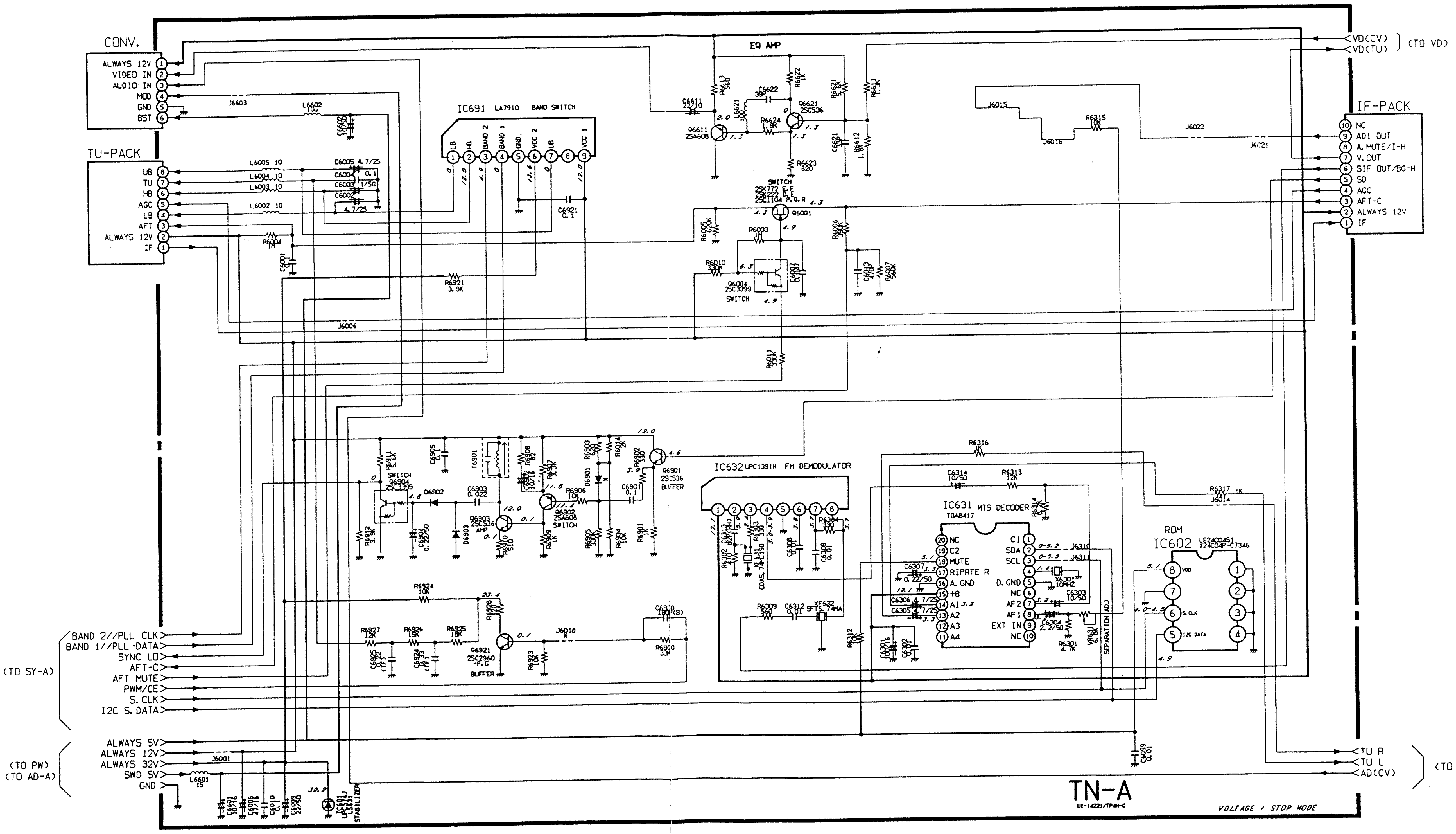
SERVO CIRCUIT WAVEFORMS (IC351:XRU2890 Series)

TEST LOCATION	WAVEFORM & MODE/LEVEL	TEST LOCATION	WAVEFORM & MODE/LEVEL
Pin 40 (H.A.SWITCHING)	 SLOW PB 5.0V 20msec 20msec	Pin 15 (CTL PULSE)	 REC 5.0V 24msec 16msec
Pin 42 (PWM)		Pin 15 (CTL PULSE)	 PB 850μsec 5.0V 40msec
Pin 41, 44, 1 (PWM)	 5.0V 69.27KHz	Pin 21 (CTL HEAD-)	 REC 3.6V 1.4V 24msec 16msec
Pin 3 (FSC INPUT)	 0.3Vp-p 4.43MHz	Pin 22 (CTL HEAD+)	 REC 1.4V 3.6V 24msec 16msec
Pin 5 (ROTARY)	 PB 5.0V 20msec 20msec	Pin 26 (CTL AMP OUT)	 PB 2Vp-p 40msec
Pin 8 (D-PG MM)	 2msec 2.5V 7msec	Pin 28 (C-FG INPUT)	 10mVp-p 0.66msec
Pin 9 (RF SW PULSE)	 5.0V 20msec 20msec	Pin 29 (D-FG INPUT)	 30mVp-p 1.33msec
Pin 10 (AF SW PULSE)	 PB 5.0V 20msec 20msec	Pin 30 (D-PG INPUT)	 250mVp-p 40msec
Pin 11 (COMPOSITE SYNC INPUT)	 4.2V T=20msec	Pin 38 (ENV.SW INPUT)	 SLOW PB 4.0V 20msec 20msec
Pin 14 (C-FG PULSE)			

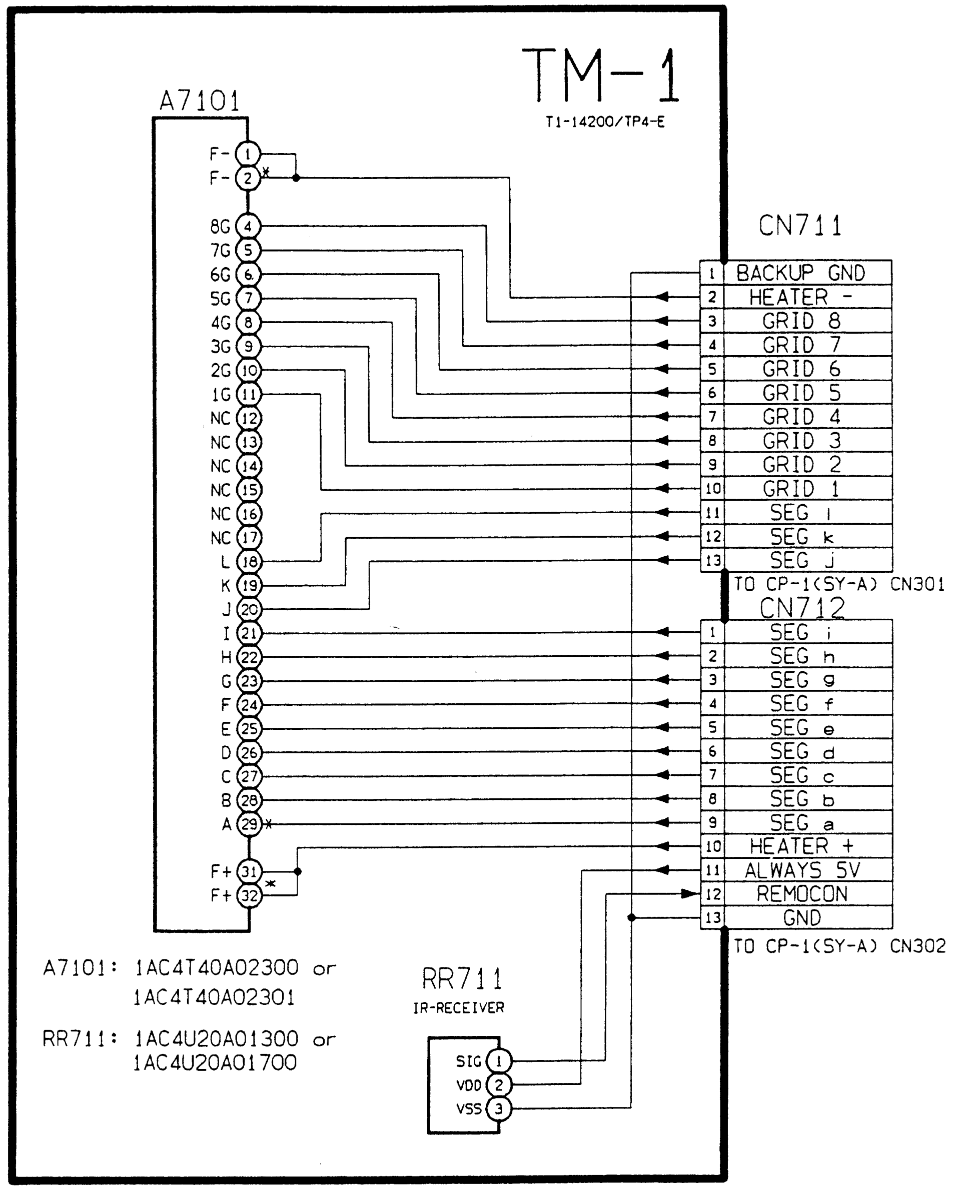
WF-S-TP4

CP-1 BOARD (TN-A,CV-A) TUNER IF, RF CONVERTER CONNECTION ,& STEREO (MTS) DECODER FOR THE MODEL VHR-390G

Note : The TN-A/CV-A circuit diagram for the model VHR-390EV is shown in page 35.


CONV.
ALWAYS 12V
VIDEO IN
AUDIO IN
MOD
GND
BST
TU-PACK
UB
TU
HB
AGC
LB
AFT
ALWAYS 12V
IF
IC691 LA7910 BAND SWITCH
EQ AMP
Q6611 2SA608
Q6621 2SC536
SWITCH
Q6001
Q6004 2SC3399 SWITCH
IF-PACK
NC
AD1 OUT
A. MUTE/I-H
V. OUT
SIF OUT/BG-H
SD
AGC
AFT-C
ALWAYS 12V
IF
VD(CV)
VD(TU)
(TO VD)
Q6901 2SC536 BUFFER
Q6902 2SA608 SWITCH
Q6903 2SC536 AMP
Q6904 2SC3399 SWITCH
Q6921 2SC2960 BUFFER
IC632 UPC1391H FM DEMODULATOR
IC631 MTS DECODER TDA8417
NC
C2
MUTE
RIPRTE R
A. GND
+8
A1
A2
A3
A4
C1
SDA
SCL
D. GND
NC
AF2
AF1
EXT IN
NC
SEPARATION ADJ
ROM
IC602 LE24C04S1
BAND 2//PLL CLK
BAND 1//PLL DATA
SYNC LO
AFT-C
AFT MUTE
PWM/CE
S. CLK
I2C S. DATA
(TO SY-A)
ALWAYS 5V
ALWAYS 12V
ALWAYS 32V
SWD 5V
GND
(TO PW)
(TO AD-A)
STABILIZER
TU R
TU L
AD(CV)
(TO AD)
TN-A
VOLTAGE : STOP MODE
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

TM-1 BOARD DISPLAY (FLD)

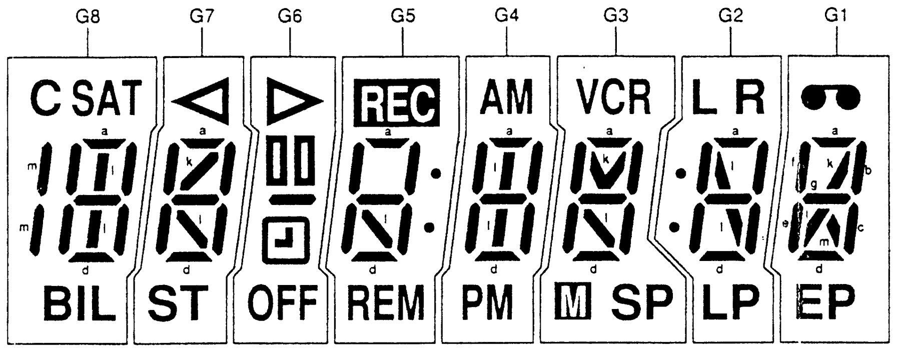

TM-1
T1-14200/TP4-E
A7101
F- 1
F- 2
8G 4
7G 5
6G 6
5G 7
4G 8
3G 9
2G 10
1G 11
NC 12
NC 13
NC 14
NC 15
NC 16
NC 17
L 18
K 19
J 20
I 21
H 22
G 23
F 24
E 25
D 26
C 27
B 28
A 29
F+ 31
F+ 32
CN711
1 BACKUP GND
2 HEATER -
3 GRID 8
4 GRID 7
5 GRID 6
6 GRID 5
7 GRID 4
8 GRID 3
9 GRID 2
10 GRID 1
11 SEG l
12 SEG k
13 SEG j
TO CP-1(SY-A) CN301
CN712
1 SEG i
2 SEG h
3 SEG g
4 SEG f
5 SEG e
6 SEG d
7 SEG c
8 SEG b
9 SEG a
10 HEATER +
11 ALWAYS 5V
12 REMOCON
13 GND
TO CP-1(SY-A) CN302
RR711
IR-RECEIVER
SIG 1
VDD 2
VSS 3

A7101: 1AC4T40A02300 or
1AC4T40A02301

RR711: 1AC4U20A01300 or
1AC4U20A01700

A7101 DISPLAY (FLD) GRID/ANODE ASSIGNMENT DRAWING & TABLE

GRID & SEGMENT ASSIGNMENT

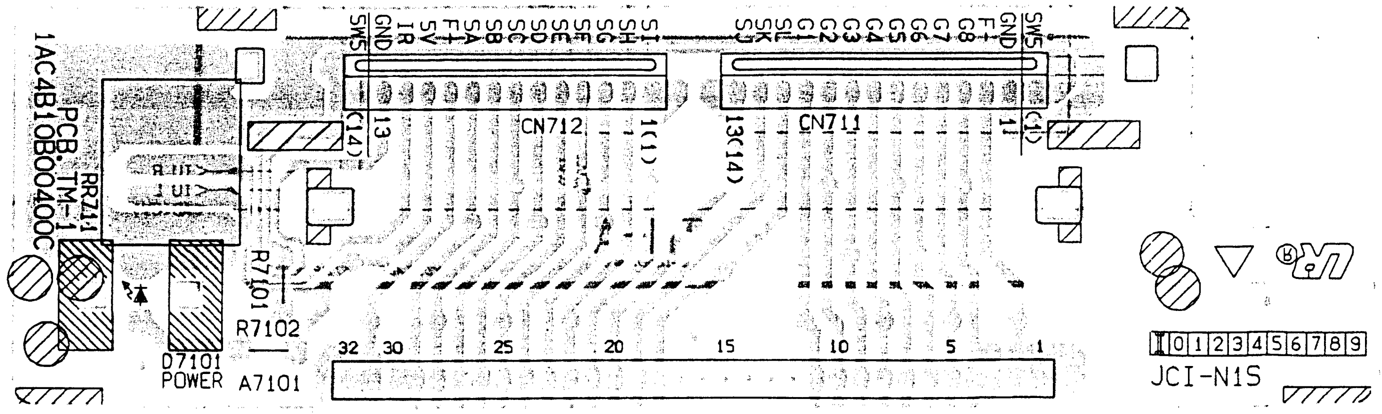

G8
G7
G6
G5
G4
G3
G2
G1
C SAT
REC
AM
VCR
L R
BIL
ST
OFF
REM
PM
M SP
LP
EP

ANODE CONNECTION

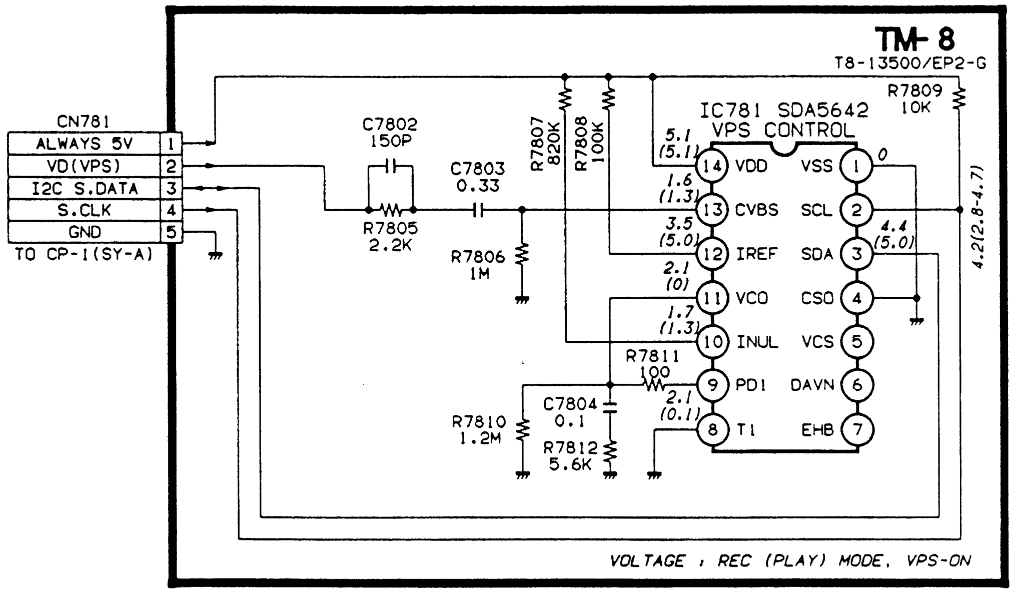
SEGMENT \ GRID	G8	G7	G6	G5	G4	G3	G2	G1
a	C	◁	▷	REC	AM	VCR	L	●
b	SAT	k	▯▯	—	—	k	R	k
c	a	a	▬	a	a	a	a	a
d	b	b	▣	b	b	b	b	b
e	c	c	—	c	c	c	c	c
f	d	d	—	d	d	d	d	d
g	e	e	—	e	e	e	e	e
h	f	f	—	f	f	f	f	f
i	g	g	—	g	g	g	g	g
j	l	l	—	l	l	l	l	l
k	m	—	—	:	—	M	:	m
l	BIL	ST	OFF	REM	PM	SP	LP	EP

GR-02300

TM-1 P.W.B.

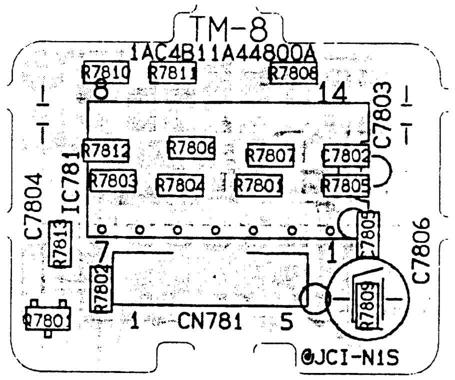

PCB TM-1
1AC4B10B00400C
RR711
R7101
R7102
D7101
POWER
A7101
CN712
CN711
SW5
GND
IR
5V
F+
SA
SB
SC
SD
SE
SF
SG
SH
SI
SJ
SK
G1
G2
G3
G4
G5
G6
G7
G8
F-
32
30
25
20
15
10
5
1
JCI-N1S
0 1 2 3 4 5 6 7 8 9

TM-8 BOARD VPS



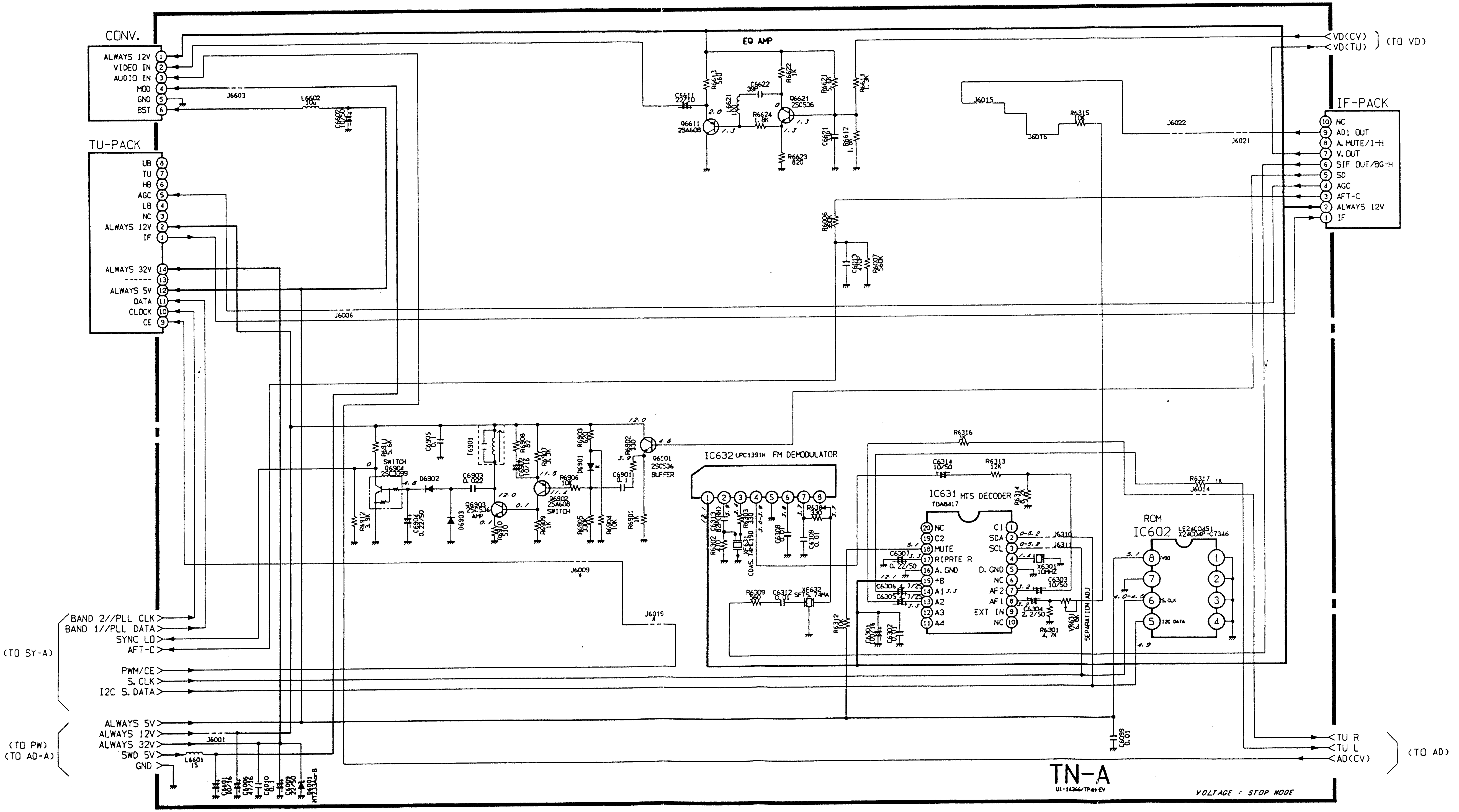
TM-8
T8-13500/EP2-G
CN781
ALWAYS 5V
VD(VPS)
I2C S.DATA
S.CLK
GND
1
2
3
4
5
TO CP-1(SY-A)
C7802
150P
R7805
2.2K
C7803
0.33
R7806
1M
R7807
820K
R7808
100K
R7809
10K
IC781 SDA5642
VPS CONTROL
5.1
(5.1)
14 VDD
1.6
(1.3)
13 CVBS
3.5
(5.0)
12 IREF
2.1
(0)
11 VCO
1.7
(1.3)
10 INUL
9 PD1
2.1
(0.1)
8 T1
VSS 1
0
SCL 2
SDA 3
4.4
(5.0)
CSO 4
VCS 5
DAVN 6
EHB 7
4.2(2.8-4.7)
R7811
100
C7804
0.1
R7810
1.2M
R7812
5.6K
VOLTAGE : REC (PLAY) MODE, VPS-ON

TM-8 P.W.B.

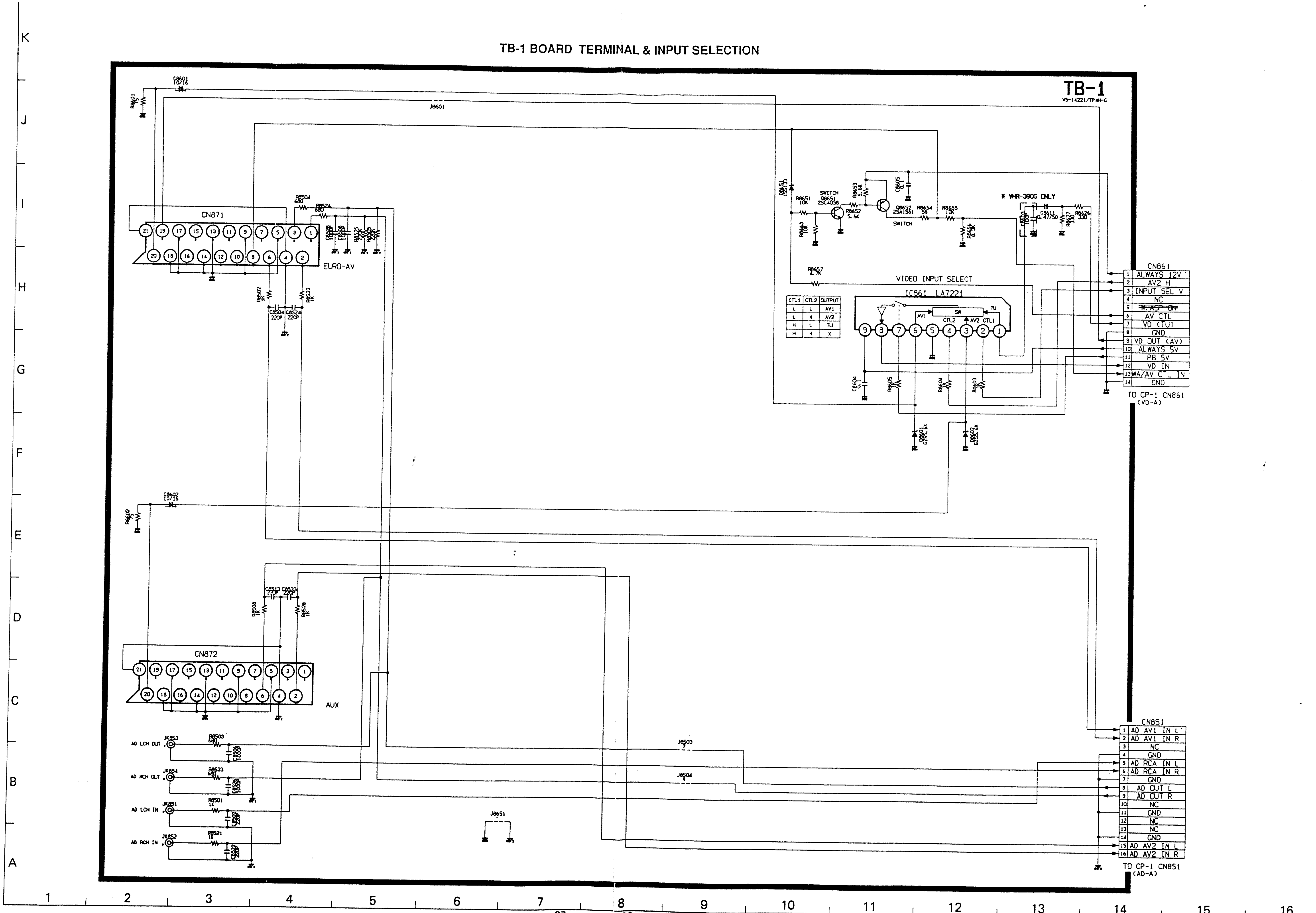


TM-8
1AC4B11A44800A
R7810
R7811
R7808
8
14
C7803
R7812
R7806
R7807
C7802
R7803
R7804
R7801
R7805
IC781
C7804
R7813
R7803
7
1
C7806
R7802
R7809
Q7801
1
CN781
5
@JCI-N1S

CP-1 BOARD (TN-A,CV-A) TUNER IF, RF CONVERTER CONNECTION ,& STEREO (MTS) DECODER FOR THE MODEL VHR-390EV


CONV.
ALWAYS 12V 1
VIDEO IN 2
AUDIO IN 3
MOD 4
GND 5
BST 6
TU-PACK
UB 8
TU 7
HB 6
AGC 5
LB 4
NC 3
ALWAYS 12V 2
IF 1
ALWAYS 32V 14
------ 13
ALWAYS 5V 12
DATA 11
CLOCK 10
CE 9
J6603
L6602 10μ
C6602
J6006
EQ AMP
C6611 22/10
Q6611 2SA608
R6613 560
L6621
C6622 39P
R6622 1K
Q6621 2SC536
R6624 1.8K
R6623 820
R6621 5.6K
C6621
R6612 1.8K
R6611 1.2K
R6606 56K
C6613
R6607 560K
J6015
J6016
R6315 10K
J6022
J6021
IF-PACK
10 NC
9 AD1 OUT
8 A. MUTE/I-H
7 V. OUT
6 SIF OUT/BG-H
5 SD
4 AGC
3 AFT-C
2 ALWAYS 12V
1 IF
VD(CV)
VD(TU)
(TO VD)
R6911 5.6K
SWITCH Q6904 2SC1829
R6912 3.9K
C6904 0.22/50
C6905 0.1
D6902
D6903
C6903 0.022
Q6903 2SC536 AMP
R6910 510
T6901
C6902
R6908 82
R6907 3.3K
R6909 1K
Q6902 2SA608 SWITCH
R6906 10K
R6903 620
D6901
R6905 330
R6904 10K
R6902 330
C6901 0.1
Q6C01 2SC536 BUFFER
R6901 1K
J6009
J6015
IC632 UPC1391H FM DEMODULATOR
R6302
C6310
R6303
X6302
COAS. TAFC01.90
C6308
R6304 330
C6309 0.01
R6316
C6314 10/50
R6313 12K
R6314
IC631 MTS DECODER TDA8417
20 NC
19 C2
18 MUTE
17 RIPRTE R
16 A. GND
15 +B
14 A1
13 A2
12 A3
11 Ad
C1 1
SDA 2
SCL 3
4
D. GND 5
NC 6
AF2 7
AF1 8
EXT IN 9
NC 10
C6307 0.22/50
C6306
C6305
R6309 560
C6312 0.01
SFT5.74MA
XF632
R6312 1K
C6301
C6302 0.01
J6310
J6311
X6301 10MHz
C6303 10/50
C6304 2.2/50
VR6301 6.8K
R6301 4.7K
SEPARATION ADJ
R6317 1K
J6014
ROM
IC602 LE24C04S1 X24C04P-C7346
8 VDD
7
6 S.CLK
5 I2C DATA
1
2
3
4
BAND 2//PLL CLK
BAND 1//PLL DATA
SYNC LO
AFT-C
(TO SY-A)
PWM/CE
S. CLK
I2C S. DATA
ALWAYS 5V
ALWAYS 12V
ALWAYS 32V
SWD 5V
GND
(TO PW)
(TO AD-A)
J6001
L6601 15
C6601
C6606
C6010 0.1
C6609
D6001 MTZ3.3C-B
C6099 0.01
TU R
TU L
AD(CV)
(TO AD)
TN-A
VOLTAGE : STOP MODE
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

TB-1 BOARD TERMINAL & INPUT SELECTION


TB-1
VS-14221/TP#4-G
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
C8601
1D716
R8601
75
J8601
CN871
EURO-AV
R8504
680
R8524
680
C8528
C8508
R8525
R8505
R8502
1K
R8522
1K
C8504
220P
C8524
220P
D8651
1SS133
R8651
10K
SWITCH
Q8651
2SC4038
R8653
5.6K
R8652
5.6K
C8605
0.1
Q8652
2SA1561
R8654
56
R8655
12K
SWITCH
R8663
10K
R8656
6.8K
※ VHR-390G ONLY
C8603
100P
C8611
0.47/50
R8627
330
R8626
330
R8657
2.7K
VIDEO INPUT SELECT
IC861 LA7221
SW
AV1
TU
CTL2
AV2
CTL1
C8604
0.1
R8605
R8604
R8603
D8601
D8602
C8602
1D716
R8602
75
C8513
220P
C8533
220P
R8508
1K
R8528
1K
CN872
AUX
AD LCH OUT
JK853
R8503
680
C8506
1000P
AD RCH OUT
JK854
R8523
680
C8526
1000P
AD LCH IN
JK851
R8501
1K
C8507
220P
AD RCH IN
JK852
R8521
1K
C8527
220P
J8503
J8504
J8651
TO CP-1 CN861
(VD-A)
TO CP-1 CN851
(AD-A)

CTL1	CTL2	OUTPUT
L	L	AV1
L	H	AV2
H	L	TU
H	H	X

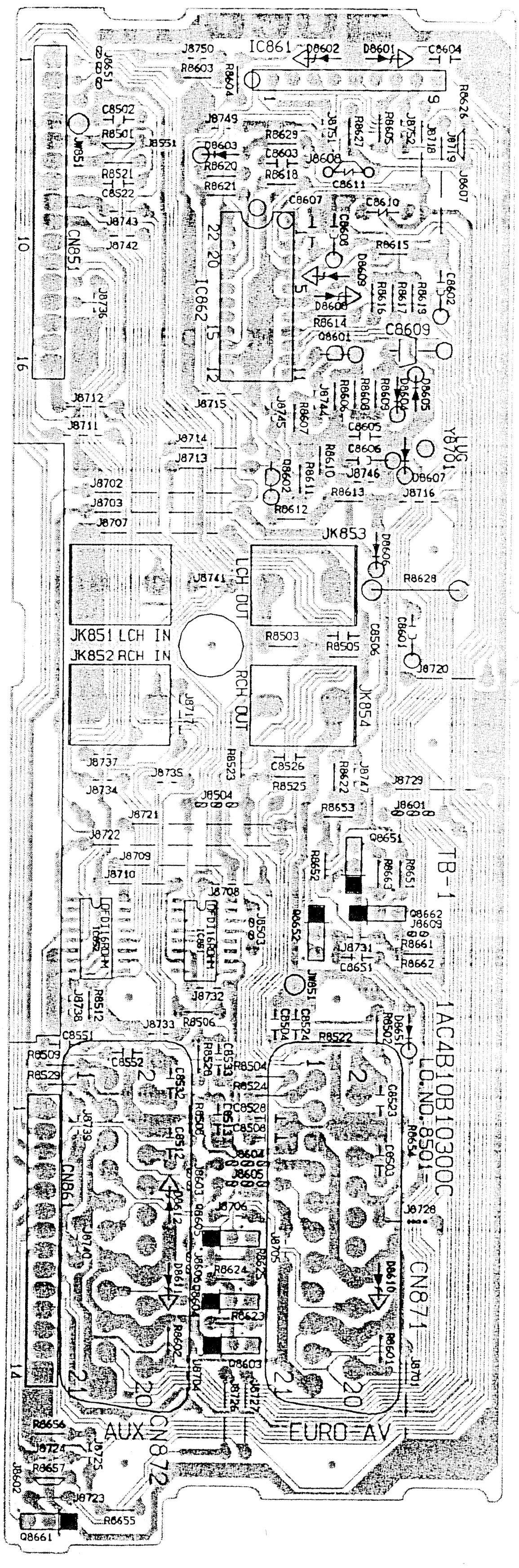
CN861

1	ALWAYS 12V
2	AV2 H
3	INPUT SEL V
4	NC
5	~~W.ASP ON~~
6	AV CTL
7	VD (TU)
8	GND
9	VD OUT (AV)
10	ALWAYS 5V
11	PB 5V
12	VD IN
13	WA/AV CTL IN
14	GND

CN851

1	AD AV1 IN L
2	AD AV1 IN R
3	NC
4	GND
5	AD RCA IN L
6	AD RCA IN R
7	GND
8	AD OUT L
9	AD OUT R
10	NC
11	GND
12	NC
13	NC
14	GND
15	AD AV2 IN L
16	AD AV2 IN R

TB-1 P.W.B.


K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC861
IC862
CN851
CN861
CN871
CN872
JK851 LCH IN
JK852 RCH IN
JK853
JK854
LCH OUT
RCH OUT
AUX
EURO-AV
TB-1
1AC4B10B10300C
LC.NO.8501-
Y8701
D8601
D8602
D8603
D8606
D8607
D8608
D8609
D8610
D8611
D8612
Q8601
Q8602
Q8651
Q8661
Q8662
C8502
C8522
C8526
C8551
C8552
C8601
C8602
C8603
C8604
C8605
C8606
C8607
C8609
C8610
C8611
C8651
R8501
R8503
R8505
R8506
R8509
R8512
R8521
R8522
R8523
R8524
R8525
R8529
R8603
R8604
R8613
R8614
R8615
R8618
R8620
R8621
R8623
R8624
R8626
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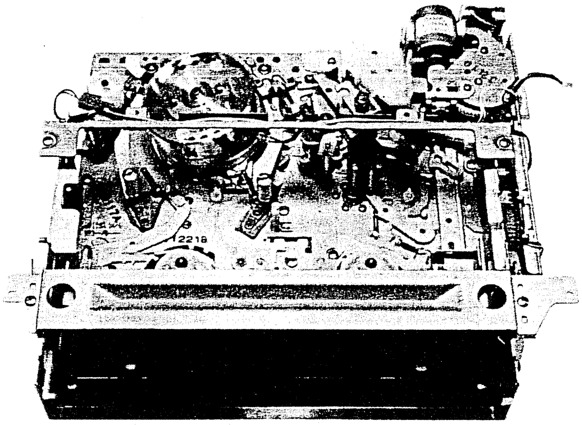
SANYO

Mechanism Service Technical Information

Colour Video
Cassette Recorder

P90 MECHANISM



VHS HQ
PAL SECAM

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1. OUTLINE OF MECHANISM

This mechanism is named P-90 Mechanism. Its features include :

(1) The chassis is fabricated by drawing a 1.6mm thick electric zinc plated steel sheet, and mechanical parts are ingeniously laid on this chassis. The mechanism is as thick as 70.3 mm.

(2) After insertion of a cassette, the tape is normally wound to the head drum based on the full loading system. This design results in the shortening of the mode shift time, that is, the time from the depression of the PLAY pushbutton switch to the video image display on screen has been significantly quickened.

(3) The full loading system employed has the F/R search capability (when the same button (F.FWD or REW) is pressed in the F.FWD or REW modes, the search mode playback image appears on the screen).

(4) Also, a thin type head drum without lead is provided to increase the operating convenience of the equipment to a considerable extent.

(5) The drive source for cassette loading and the motor for the tape loading mode selection are used in combination with the head motor and the capstan motor for realization of a 3-motor system.

1-1. FULL LOADING MECHANISM

(1) Description of full loading mechanism
As shown in Fig. 1-1 a tape has hitherto been wound onto the head drum only in the PLAY and F/R SEARCH mode, but in this radically new mechanism, in every mode can be made with the tape kept wound onto the head drum.

(2) Features of full loading mechanism
With the provision of the full loading mechanism, the operating convenience, which was hitherto a drawback of the VHS system, has been improved. A host of other salient features are also designed into this mechanism as apparent from the following description.

I. Quick playback
Mode shift time such as the STOP→PLAY and FF/REW→PLAY has been shortened for quicker playback.

II. High-speed VISS
The time from the detection of VISS search signal based on the VHS standardized search system till image display on the screen has considerably been shortened to make high-speed VISS possible.

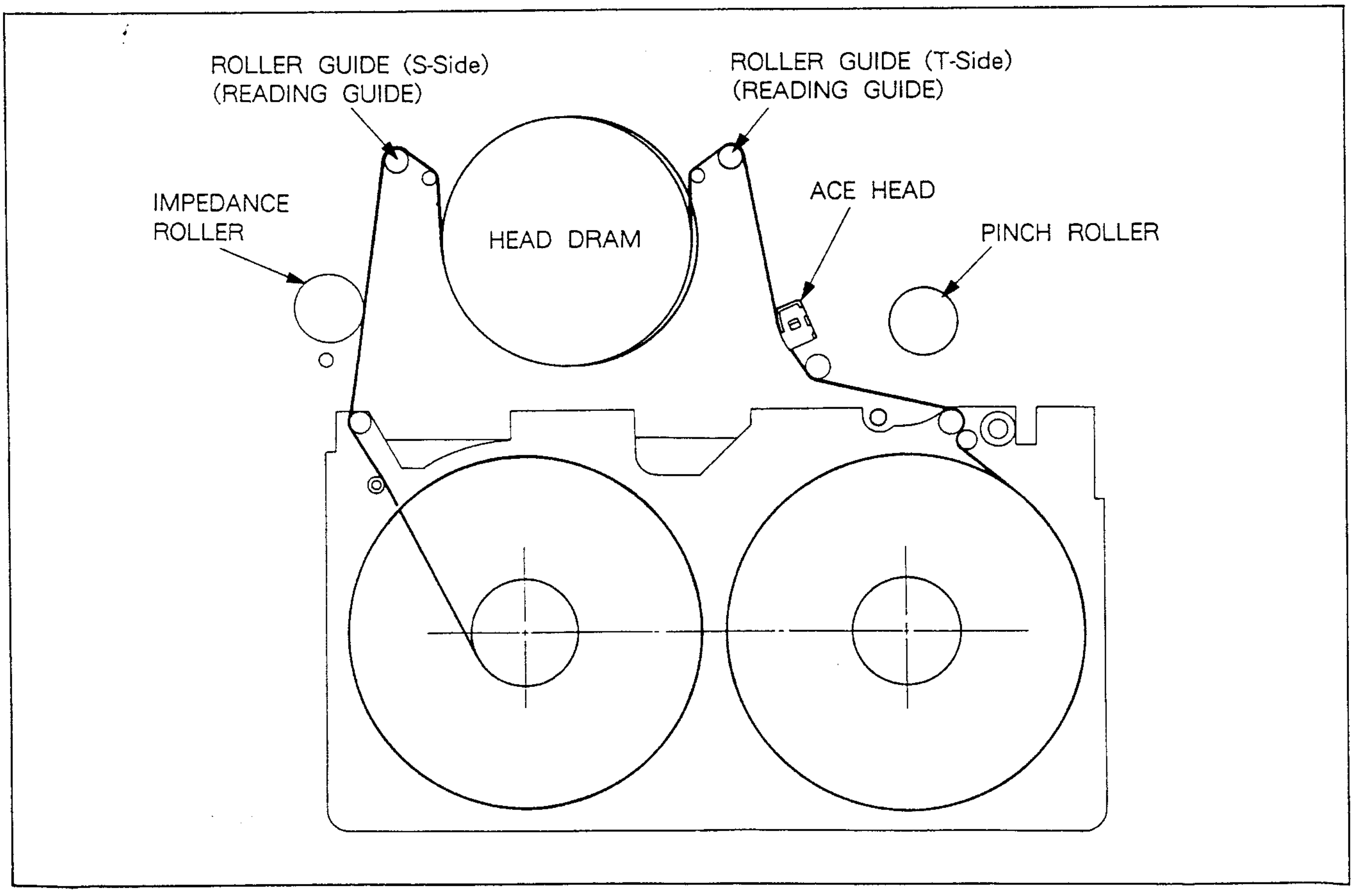


Fig. 1-1 FULL LOADING SYSTEM (AT FF/REW MODE)

III. F／R search
FF↔F-SEARCH and REW↔R-SEARCH can be made direct by reducing the mode transition time.

(3) Protection mechanism for full loading system

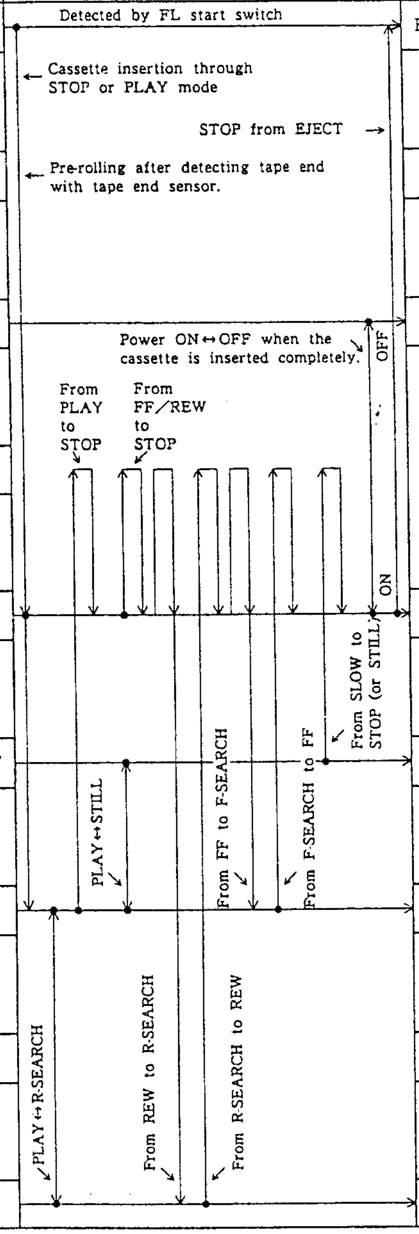
I. Video Tape Protection Mechanism
(a) FF／REW→STOP
Tape tension applied to the head drum when stopping is lowered by optimizing the balance between the left and right, and brake forces acting on the left and right reel table. Thereby it prevents from causing a scratch on the tape due to V-head when stopping.
(b) STOP→FF／REW
The starting-up speed of the capstan motor is ingeniously designed to preclude the possibility of unusual tape tension at the time of REW／FWD start-up.
(c) Tape end brake damping
The design of the mechanism is so made that the time from issuance of an electrical STOP command till actual brake application is reduced to a minimum. This enable the braking to be completed before the reader tape end.
(d) FF／REW running
To ensure highly stable tape running in any condition and any environment, design consideration is given to the foundation brake torque (soft brake) to the reel table and the tape winding angle with respect to each tape guide. Particularly in regard to the supply side fixing guide and F.T.E (Full Track Erase) head, the design is so made that they do not come into contact with the tape at the time of FF／REW operation to alleviate load application.

II. Final End Position Tape Loading Protection Mechanism
Tape pull-out (loading) from within the cassette is done to ensure proper take-up of the tape onto the head drum. At that time, the tape is extended from the supply reel side.
So, if the tape is wound to the final end, no loading can be made. For this reason, a mode is designed to allow the tape to be rewound a little at the final end of the tape without any loading done.

2. DESCRIPTION OF MECHANISM OPERATION

2-1. BASIC OPERATION MODE OF MECHANISM

The P-90 mechanism has its original modes such as given in Table 2-1, in addition to the VTR is operation modes (STOP, FF, REW, PLAY, REC, R-SEARCH, F-SEARCH, STILL, SLOW, and ETS). These modes specific to the mechanism play important roles in tape protection operation at the time of a shift to various modes of the VTR above. A shift to the mode specific to the mechanism is carried out by controlling the rotation of the loading motor with the control signal of the system control circuit. The detection of important mechanism operation mode positions is done by using the FL START SWITCH for detecting the cassette ejection/insertion, and the MECHANISM MODE SWITCH for detecting each mode of the mechanism (3 bit MODE DATA is output by operating the rotary switch).

Mechanism Mode	Mechanism Mode Switch 3	2	1	HEX DATA	Function	Main Mode Shifting Conditions	VTR Operation Mode
EJECT	–	–	–		Eject position		EJECT
					Front loading/Unloading		
SHORT REW	–	–	–		Take up operation in the tape end position		Low side of ⑤. Sensed upon IN
INITIAL	1	1	1	⑦	Power off position		Power off when tape is loaded completely
					Tape unloading position Tape loading Tape loading ending position		
BRAKE	0	0	1	①	Main brake applying position		
STOP / FF/REW	0	1	0	②	STOP waiting and FF/REW (the head motor rotation)		STOP, FF/REW
STILL	0	1	1	③	The positions of STILL, SLOW or F-ADV.		STILL, SLOW, F-ADV
PLAY	1	0	0	④	From FWD direction Normal running mode		PLAY, REC, F-SEARCH
IDLER	1	0	1	⑤	Forward/reverse changeover position		PAUSE
REV	1	1	0	⑥	From REV direction Normal running mode		R-SEARCH

Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor.
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔STILL
PLAY↔R-SEARCH
From REW to R-SEARCH
From R-SEARCH to REW

Table 2-1

2-2. DESCRIPTION OF MECHANISM DRIVE

To realize the thin type mechanism, a loading motor and two pieces of cam (MAIN CAM GEAR and the MODE CAM GEAR) to be driven by the said motor are mounted on the upper part of the capstan motor, that was a dead space in the conventional mechanisms hitherto available with a view to optimization of parts mounting layout. (Fig. 2-1 and Fig. 2-2.)

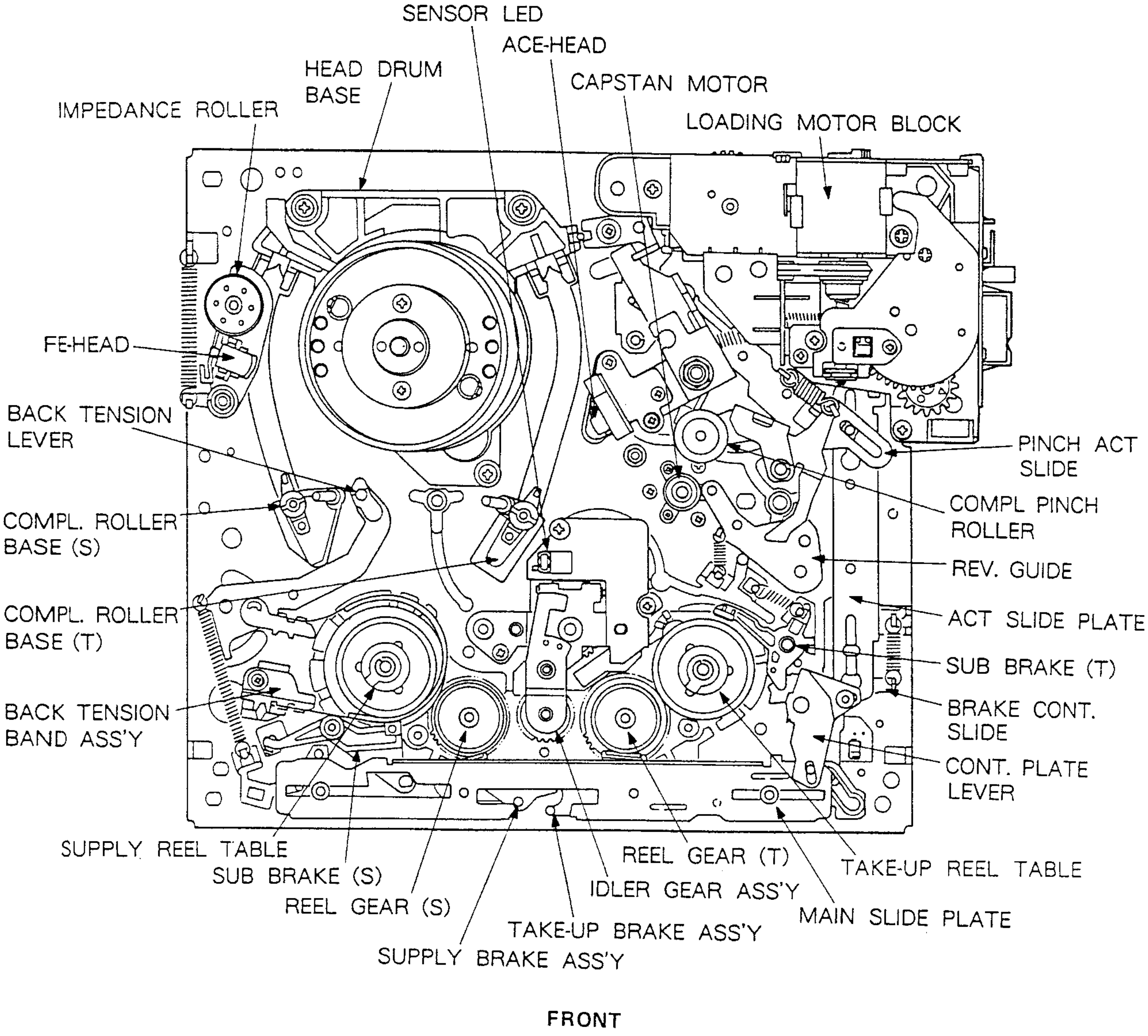

SENSOR LED
ACE-HEAD
HEAD DRUM BASE
CAPSTAN MOTOR
IMPEDANCE ROLLER
LOADING MOTOR BLOCK
FE-HEAD
BACK TENSION LEVER
COMPL. ROLLER BASE (S)
COMPL. ROLLER BASE (T)
BACK TENSION BAND ASS'Y
PINCH ACT SLIDE
COMPL PINCH ROLLER
REV. GUIDE
ACT SLIDE PLATE
SUB BRAKE (T)
BRAKE CONT. SLIDE
CONT. PLATE LEVER
SUPPLY REEL TABLE
SUB BRAKE (S)
REEL GEAR (S)
REEL GEAR (T)
IDLER GEAR ASS'Y
TAKE-UP REEL TABLE
MAIN SLIDE PLATE
TAKE-UP BRAKE ASS'Y
SUPPLY BRAKE ASS'Y
FRONT

Fig. 2-1 TOP VIEW OF MECHANISM (INITIAL MODE)

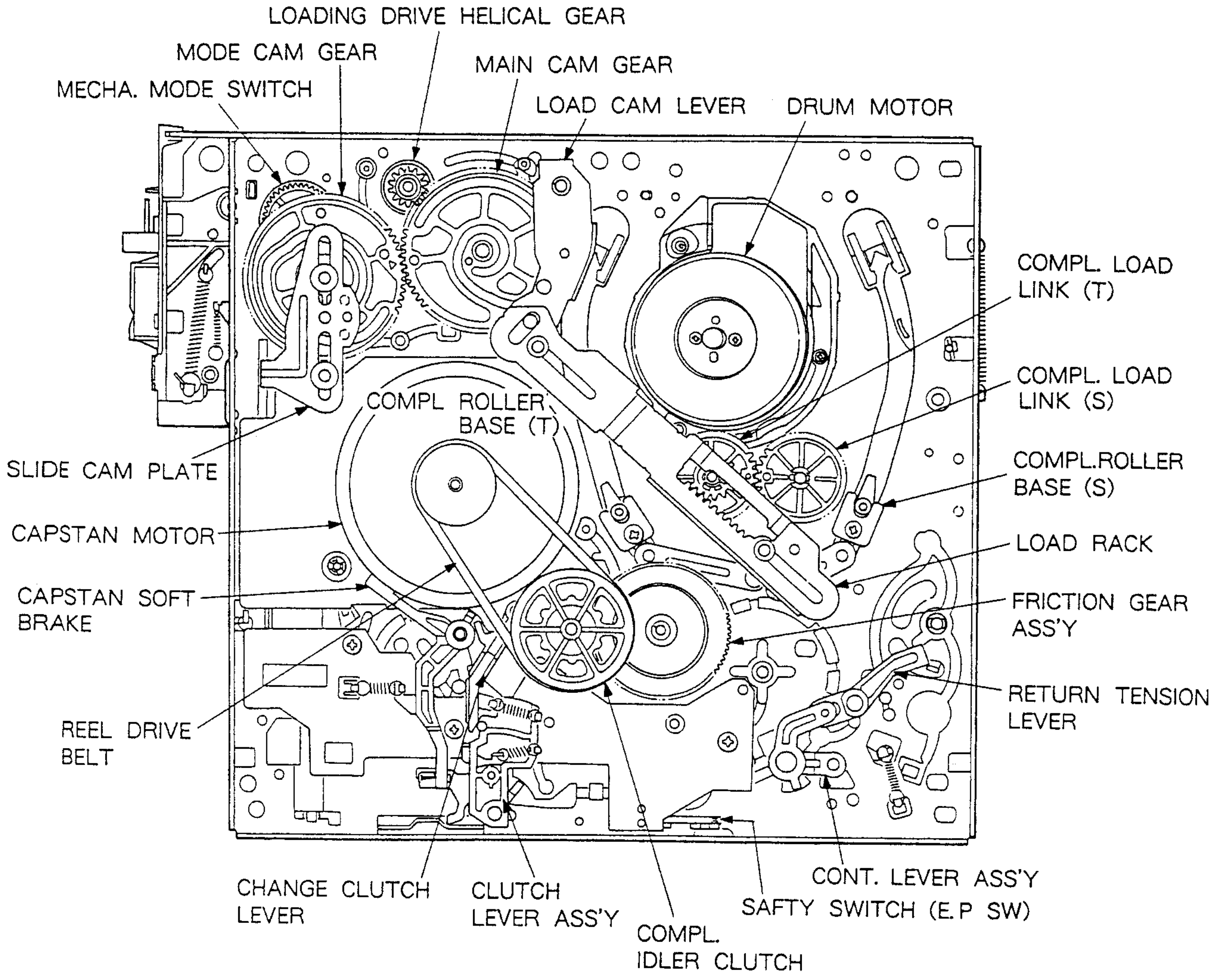

LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MECHA. MODE SWITCH
MAIN CAM GEAR
LOAD CAM LEVER
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
COMPL.ROLLER BASE (S)
LOAD RACK
FRICTION GEAR ASS'Y
RETURN TENSION LEVER
COMPL ROLLER BASE (T)
SLIDE CAM PLATE
CAPSTAN MOTOR
CAPSTAN SOFT BRAKE
REEL DRIVE BELT
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
COMPL. IDLER CLUTCH
CONT. LEVER ASS'Y
SAFTY SWITCH (E.P SW)
FRONT

Fig. 2-2 BOTTOM VIEW OF MECHANISM (INITIAL MODE)

These two cams have one CAM GROOVE on both sides. A total of four CAM GROOVEs performs independent functions to meet the multi-function needs of these days by driving the elements of a wide variety of functions with the motor precisely controlled by a microcomputer.
The two cams are positive motion cams having a groove over 570 degrees. These cams cause the amount of lift to be changed by a mild gradient according to the angle of rotation while synchronizedly being rotated by an outer circumferential gear to alleviate the load exerted on the cams when driving the rod linked with the cams and also to ensure position stability in each mode of operation. The geometry of each cam and that of a metal fitting of the drive section are shown in Fig. 2-3 and Fig. 2-4, respectively. Also, the role of each cam used is described below.
On the GROOVE 3 side of MODE CAM GEAR have a small gear. This small gear is engaged with the MECHANISM MODE SWITCH as shown in Fig. 2-3., and detect the mechanism operation mode. In this way, the two cams and the MECHANISM MODE SWITCH are rotated synchronously, and the mechanism is fully synchronized and driven for each mode.

MAIN CAM GEAR :	CAM GROOVE 1. Pinch roller pressing operation CAM GROOVE 2. Tape loading mechanical drive
MODE CAM GEAR :	CAM GROOVE 3. Brake and clutch selecting operation CAM GROOVE 4. Brake control and front unloading control

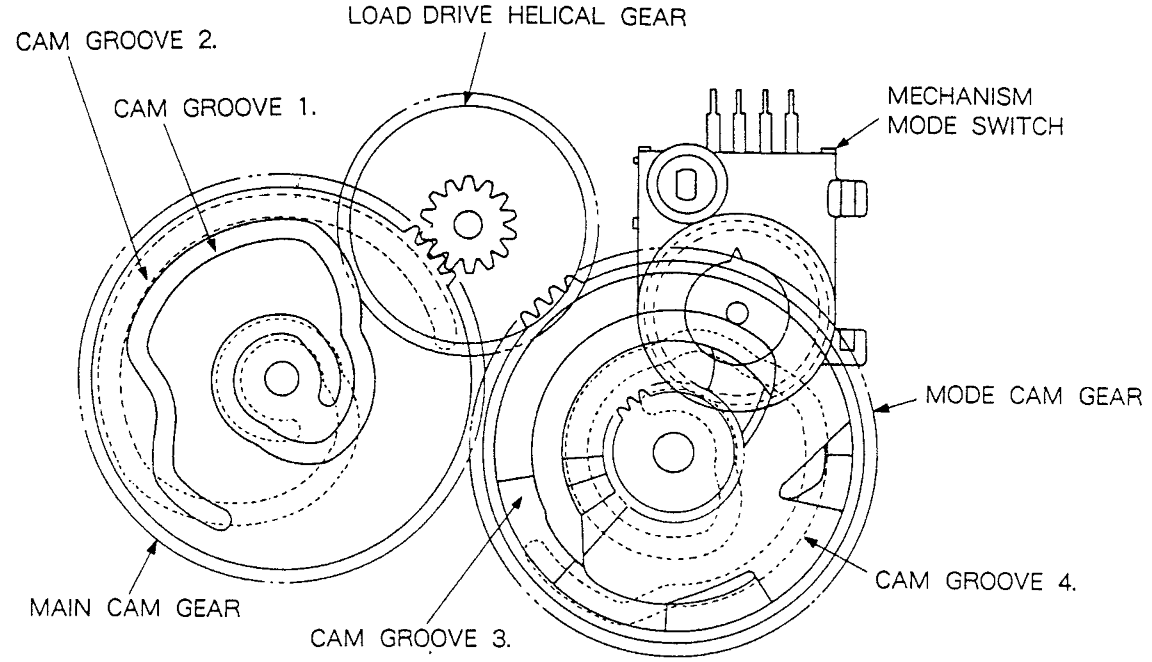


Fig. 2-3 PLAN OF CAMS CONSTRUCTION

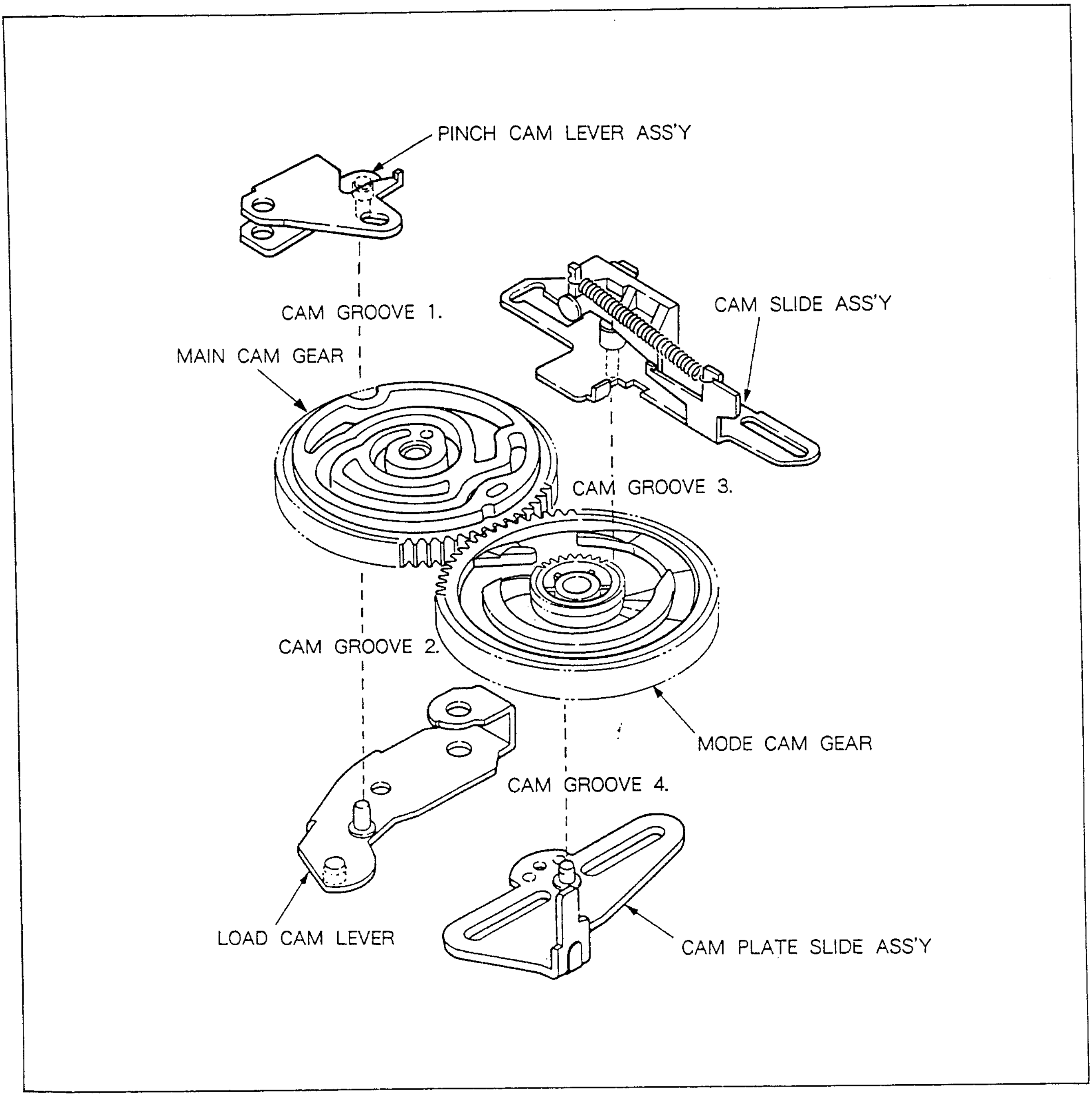

PINCH CAM LEVER ASS'Y
CAM SLIDE ASS'Y
CAM GROOVE 1.
MAIN CAM GEAR
CAM GROOVE 3.
CAM GROOVE 2.
MODE CAM GEAR
CAM GROOVE 4.
LOAD CAM LEVER
CAM PLATE SLIDE ASS'Y

Fig. 2-4 VIEW OF CAMS CONSTRUCTION

2-2-1. Tape Loading Mechanism

The tape loading mechanism is compactly designed with use of a LOAD RACK for loading by drive from the before-mentioned MAIN CAMs with CAM GROOVE 2. The LOAD RACK is laid on the dead space in between the DD capstan motor and the head motor for effective space utilization.(Fig. 2-5) The process from tape pull-out upon loading to contact of the leading guide section with the stopper of drum base and press-fitting under tension of spring is guided and driven in such a manner that the rod is drawn inward from the outer circumferential direction of the CAM GROOVE 2, thereby reducing the load torque (PV value) to the CAM GROOVE. And, the load of the loading motor is minimized to enhance reliability.

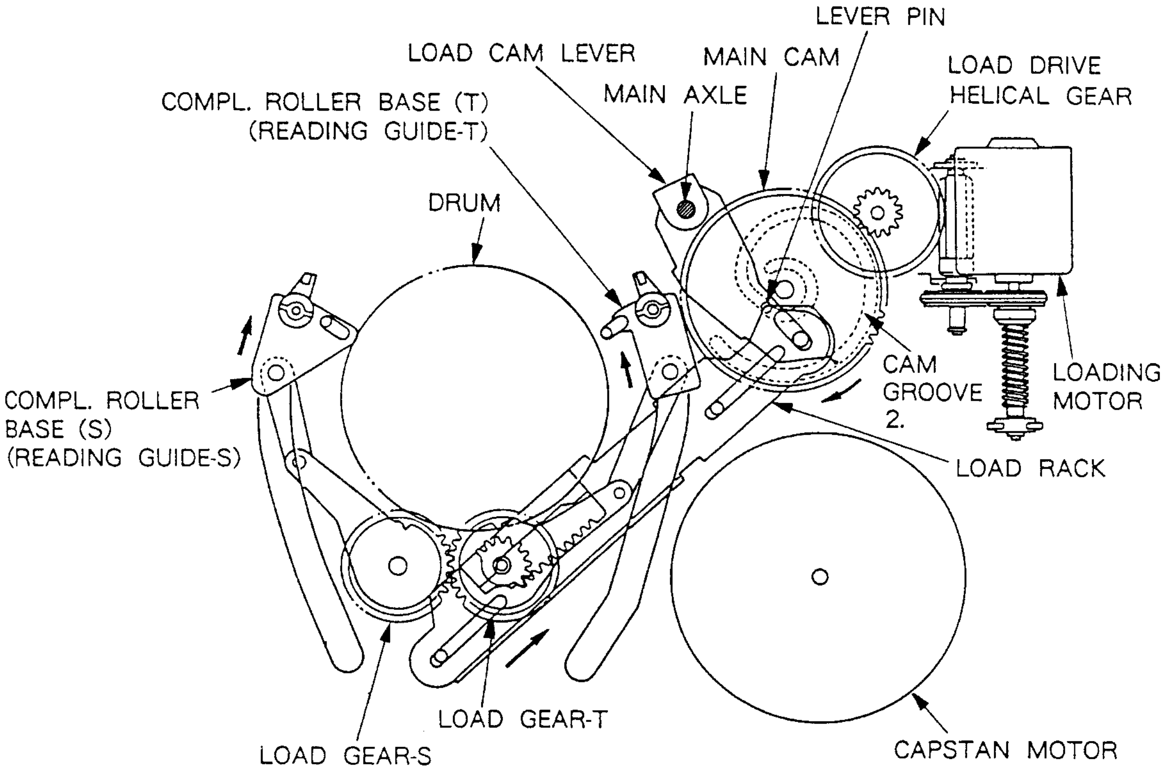

LEVER PIN
LOAD CAM LEVER
MAIN CAM
LOAD DRIVE HELICAL GEAR
MAIN AXLE
COMPL. ROLLER BASE (T) (READING GUIDE-T)
DRUM
CAM GROOVE 2.
LOADING MOTOR
COMPL. ROLLER BASE (S) (READING GUIDE-S)
LOAD RACK
LOAD GEAR-T
LOAD GEAR-S
CAPSTAN MOTOR

Fig. 2-5 CONSTRUCTION OF TAPE LOADING MECHANISM

2-2-2. Pinch Roller Pressing Mechanism

The PINCH LEVER assembly of the pinch roller is operated by the PINCH CAM LEVER (rod) driven by the CAM GROOVE 1 of the before-mentioned MAIN CAM, and then press-fitted to the capstan. The revolving tape guide (REV.GUIDE) is interlockingly operated with the PINCH LEVER assembly to ensure stable tape running at a fixed speed. (Fig. 2-6)

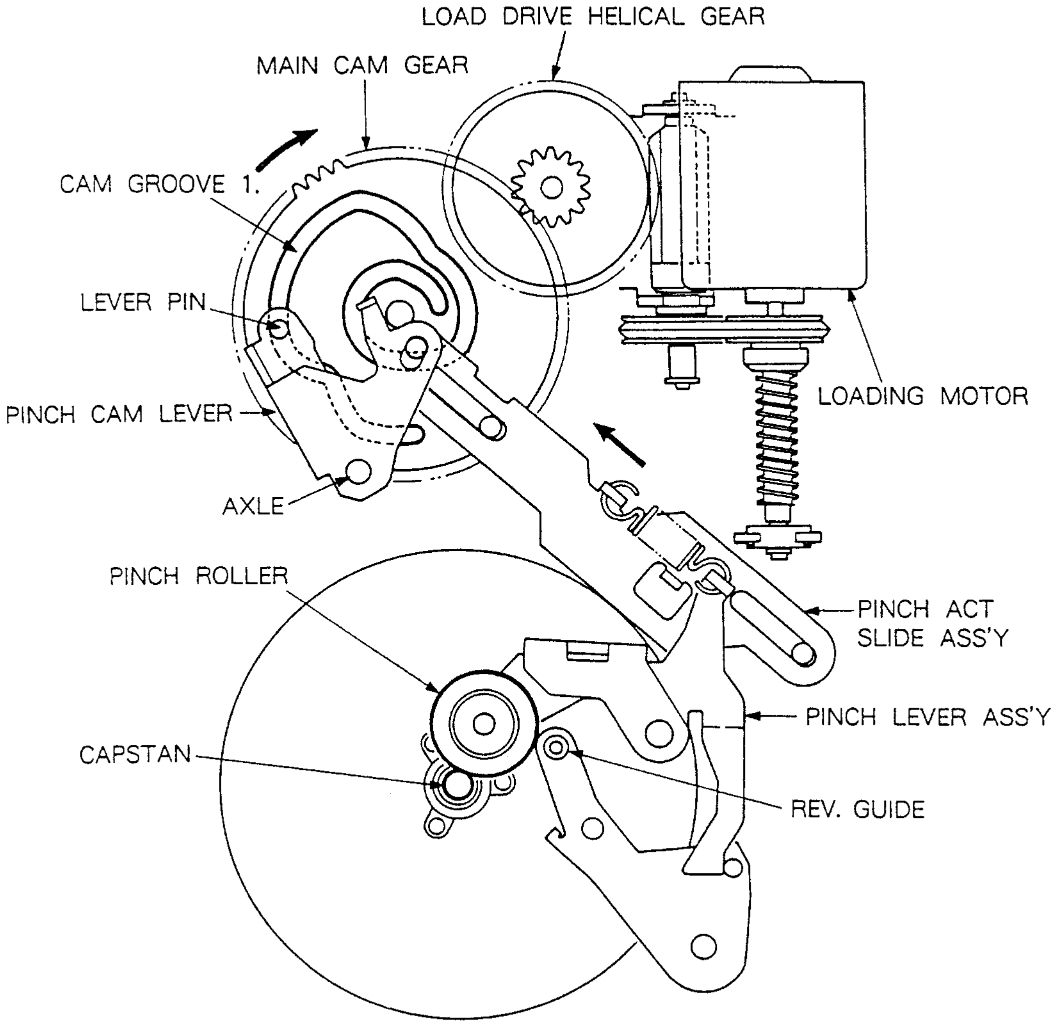

LOAD DRIVE HELICAL GEAR
MAIN CAM GEAR
CAM GROOVE 1.
LEVER PIN
PINCH CAM LEVER
AXLE
LOADING MOTOR
PINCH ROLLER
PINCH ACT SLIDE ASS'Y
PINCH LEVER ASS'Y
CAPSTAN
REV. GUIDE

Fig. 2-6 CONSTRUCTION OF PINCH ROLLER MECHANISM

2-2-3. Operation of Brake Control Plate

The ACT SLIDE PLATE and the MAIN SLIDE PLATE shown in Fig. 2-7 is driven by the CAM GROOVE 4 of the MODE CAM GEAR for precise control of operations including the control of back tension lever, auxiliary brake (SUB BRAKE S/T), main brake (SUPPLY BRAKE and TAKE-UP BRAKE), clutch selection, and drive selection of front loading mechanism.

Also, the mechanism mode switch is engaged with the small gear of the MODE CAM GEAR for sync rotation. At the time, the detection position of each mode is set so that it becomes the flat section at the cam curve of the CAM GROOVE 4 of the MODE CAM GEAR. So, even if motor stop time deviation occurs due to the load following the detection of the loading motor stop position, the control plate linked with a stop in the specified position.

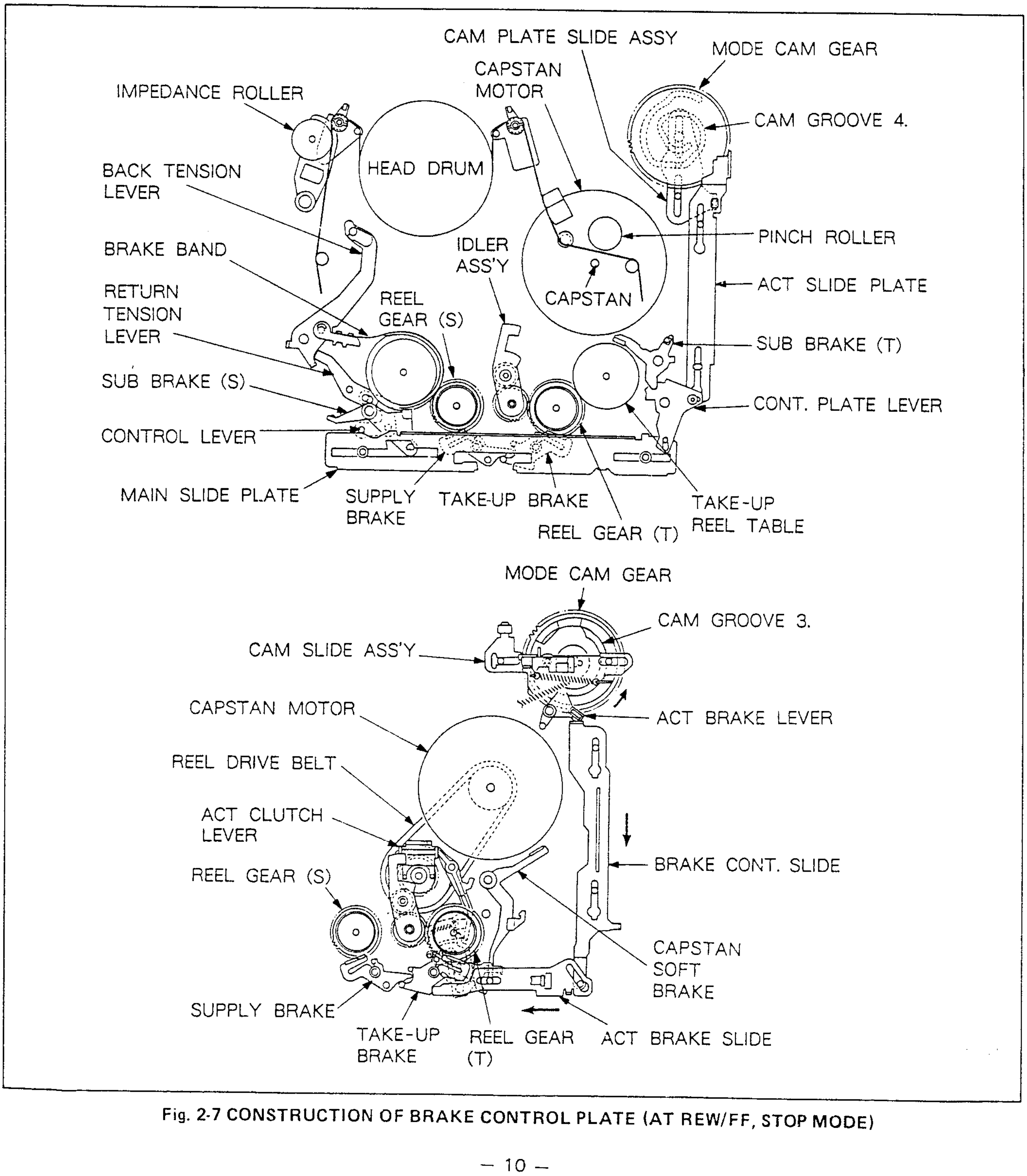

CAM PLATE SLIDE ASSY
MODE CAM GEAR
CAPSTAN MOTOR
IMPEDANCE ROLLER
CAM GROOVE 4.
BACK TENSION LEVER
HEAD DRUM
PINCH ROLLER
BRAKE BAND
IDLER ASS'Y
ACT SLIDE PLATE
RETURN TENSION LEVER
REEL GEAR (S)
CAPSTAN
SUB BRAKE (T)
SUB BRAKE (S)
CONT. PLATE LEVER
CONTROL LEVER
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE-UP REEL TABLE
REEL GEAR (T)
MODE CAM GEAR
CAM GROOVE 3.
CAM SLIDE ASS'Y
CAPSTAN MOTOR
ACT BRAKE LEVER
REEL DRIVE BELT
ACT CLUTCH LEVER
BRAKE CONT. SLIDE
REEL GEAR (S)
CAPSTAN SOFT BRAKE
SUPPLY BRAKE
TAKE-UP BRAKE
REEL GEAR (T)
ACT BRAKE SLIDE

Fig. 2-7 CONSTRUCTION OF BRAKE CONTROL PLATE (AT REW/FF, STOP MODE)

2-2-4. Brake Control Mechanism

The mechanical logic of the brake state is shown in Fig. 2-8. The brake which damps the reel rotation is operated by the BRAKE CONTROL SLIDE driven from the CAM GROOVE 3 of the MODE CAM GEAR.

Also, to alleviate damage to the tape caused by high tension of the brake in operation, the tape is stopped after brake operation and the shape is thoughtfully designed for proper biting-in ratio of the left and the right brakes after-mentioned to each other.
This enables the supply brake to be released by the operation of the above-mentioned MAIN SLIDE PLATE after an elapse of prefixed slight time to reduce the tape tension to zero, and to provide the tape with a proper degree of looseness. As a result, a slight gap is created in the tape from the HEAD DRUM.

Further, a momentary still mechanism which dispenses with use of a plunger solenoid is not provided as one of design features of the P-90 mechanism.
To stabilize the image in an extremely short period of time during a shift to the STILL mode from the PLAY mode, the auxiliary brake (CAPSTAN SOFT BRAKE) is press-fit to the outer circumference of the capstan motor by the before-mentioned CAM GROOVE 3 of the MODE CAM GEAR.
These operations is interlocked with the operation of the before-mentioned ACT SLIDE PLATE and the MAIN SLIDE PLATE. It consists of one MODE CAM for offsetting the operating position.

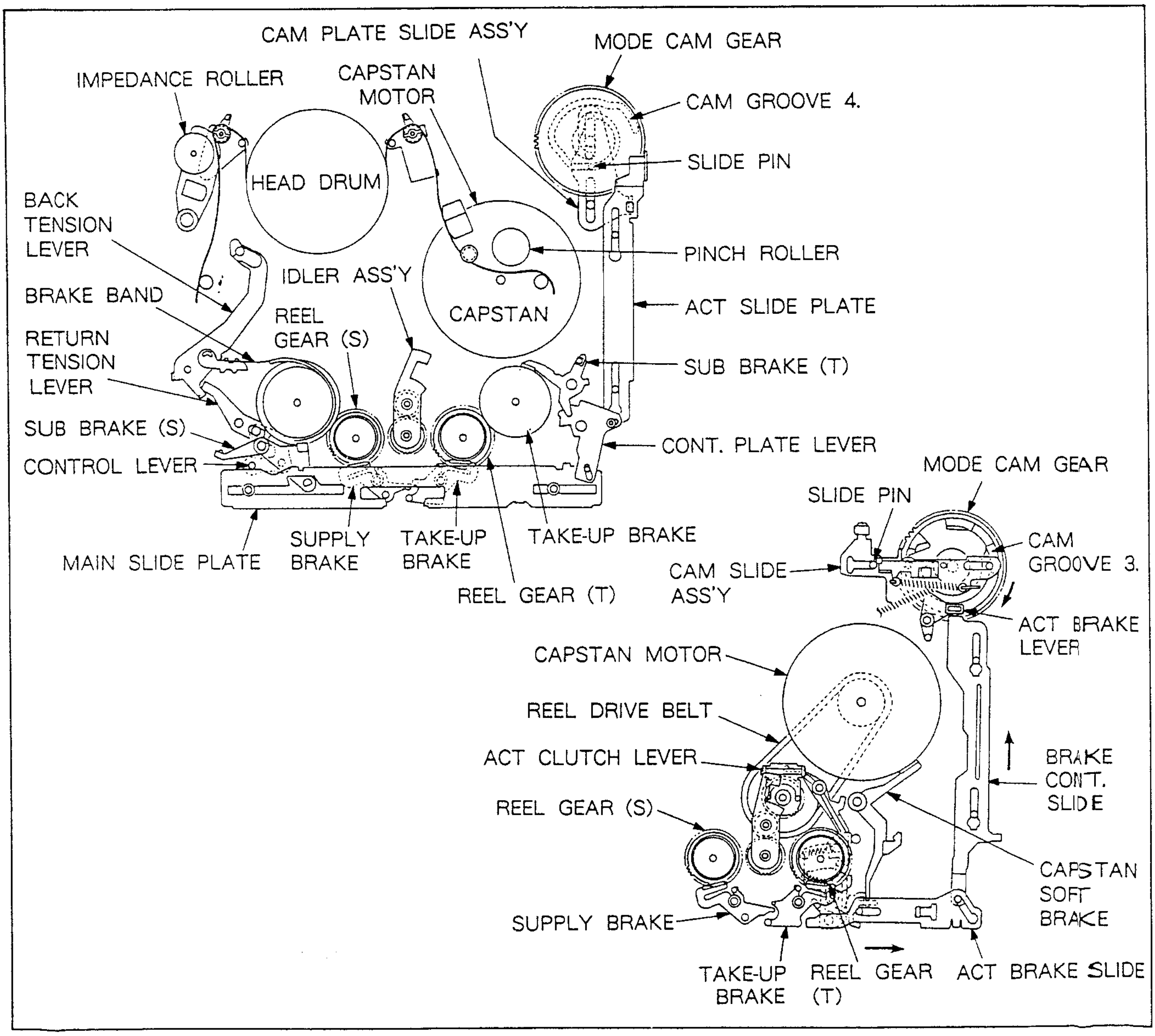

CAM PLATE SLIDE ASS'Y
MODE CAM GEAR
IMPEDANCE ROLLER
CAPSTAN MOTOR
CAM GROOVE 4.
SLIDE PIN
HEAD DRUM
BACK TENSION LEVER
PINCH ROLLER
IDLER ASS'Y
BRAKE BAND
ACT SLIDE PLATE
REEL GEAR (S)
CAPSTAN
RETURN TENSION LEVER
SUB BRAKE (T)
SUB BRAKE (S)
CONT. PLATE LEVER
CONTROL LEVER
MODE CAM GEAR
SLIDE PIN
MAIN SLIDE PLATE
SUPPLY BRAKE
TAKE-UP BRAKE
TAKE-UP BRAKE
CAM GROOVE 3.
CAM SLIDE ASS'Y
REEL GEAR (T)
ACT BRAKE LEVER
CAPSTAN MOTOR
REEL DRIVE BELT
BRAKE CONT. SLIDE
ACT CLUTCH LEVER
REEL GEAR (S)
CAPSTAN SOFT BRAKE
SUPPLY BRAKE
TAKE-UP BRAKE
REEL GEAR (T)
ACT BRAKE SLIDE

Fig. 2-8 CONSTRUCTION OF BRAKE CONTROL PLATE (AT BRAKE MODE)

2-2-5. Brake Lock Release Mechanism (FF/REW→STOP Mode)

The brake lock momentary release mechanism is shown in Fig. 2-9 ⓐ, ⓑ and Fig. 2-10.
In the FF/REW mode (Fig. 2-9 ⓐ) mechanical elastic load is given to the BRAKE LOCK LEVER mounted on the BRAKE CAM SLIDE which causes the brake to operate, and it is locked to the high-speed rotary axle of the 1st reducing section of the loading motor.

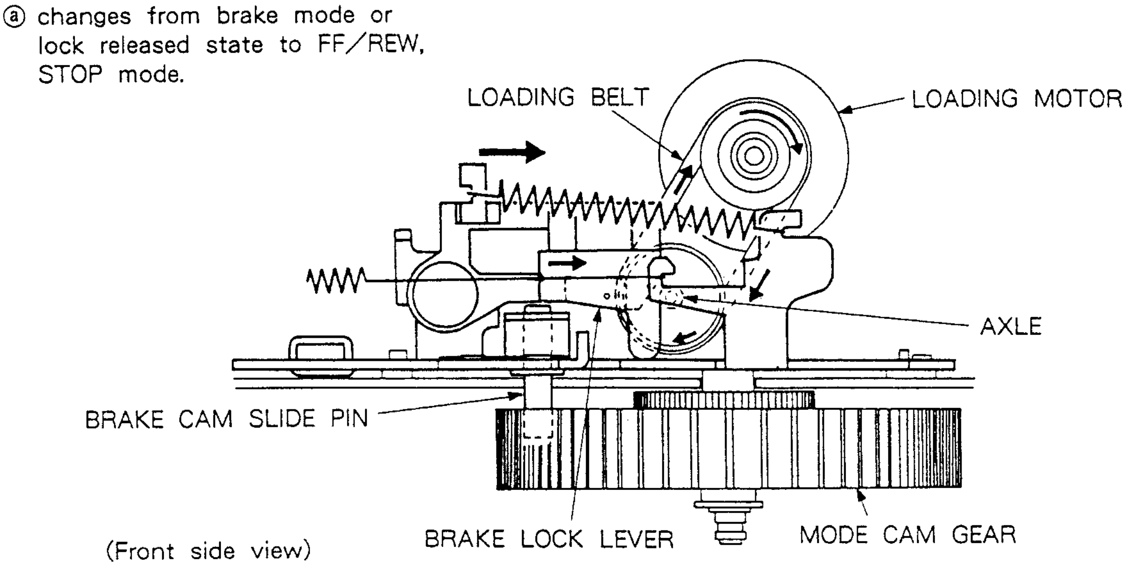

ⓐ changes from brake mode or
lock released state to FF/REW,
STOP mode.
LOADING BELT
LOADING MOTOR
AXLE
BRAKE CAM SLIDE PIN
BRAKE LOCK LEVER
MODE CAM GEAR
(Front side view)

Fig. 2-9 ⓐ BRAKE LOCK & RELEASE MECHANISM

At the time of a shift to the STOP mode from the FF/REW (Fig. 2-9 ⓑ), the BRAKE LOCK LEVER releases the lock on slight rotation of the axle by contact between the rotary shaft and the friction resistance so that the brake can be instantaneously applied to the reel. The lock release speed is almost the same as the start-up of the loading motor. So, the its response to the brake is very quick, and construction is simplified also.

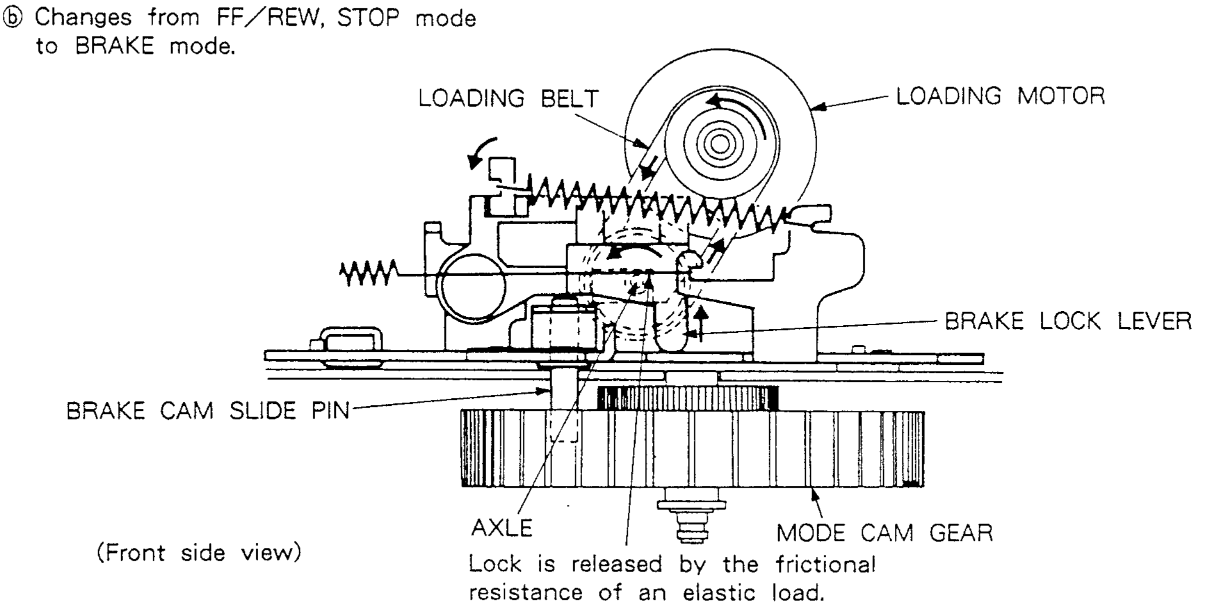

ⓑ Changes from FF/REW, STOP mode
to BRAKE mode.
LOADING BELT
LOADING MOTOR
BRAKE LOCK LEVER
BRAKE CAM SLIDE PIN
AXLE
MODE CAM GEAR
Lock is released by the frictional
resistance of an elastic load.
(Front side view)

Fig. 2-9 ⓑ BRAKE LOCK & RELEASE MECHANISM

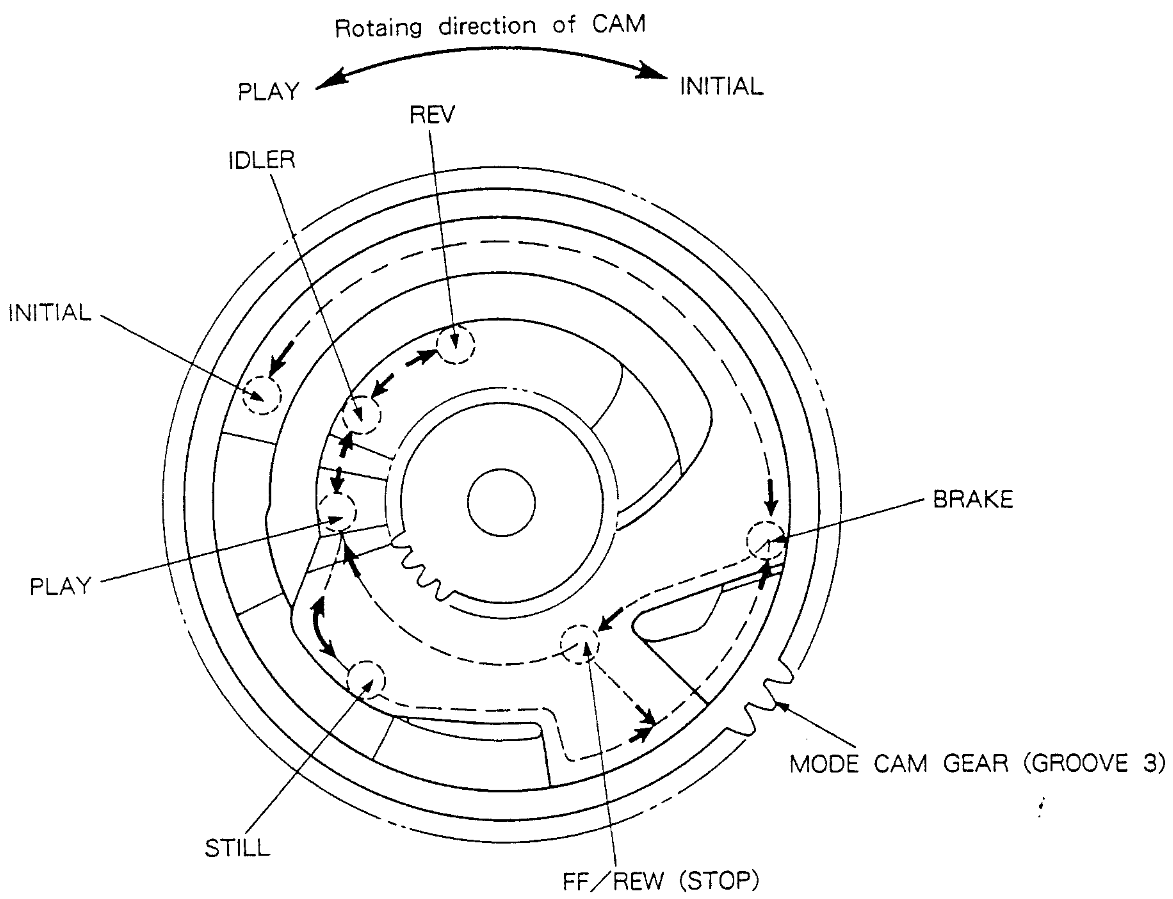

Rotaing direction of CAM
PLAY
INITIAL
REV
IDLER
INITIAL
BRAKE
PLAY
MODE CAM GEAR (GROOVE 3)
STILL
FF/REW (STOP)

Fig. 2-10 POSITIONING OF BRAKE CAM SLIDE-PIN ON THE GROOVE 3 OF MODE CAM GEAR

2-3. REEL TABLE DRIVE

2-3-1. Reel Table Drive Mechanism

This mechanism employs the system of driving the tape from the DD capstan motor via rubber belt. In the tape constant speed running mode for PLAY, F-SEARCH, and R-SEARCH, the capstan and the pinch roller are press-fitted to allow the tape to run at a constant speed. By providing a FRICTION MECHANISM in between the capstan motor and the reel table, the tape is taken up. In the FF/REW tape high-speed take-up mode, the capstan and the pinch roller are separated from each other, and the capstan motor and the reel table are linked direct by the clutch mechanism to carry out tape take-up. Also, to realize a thin type reel table drive section, the mechanism is simplified and the rotary parts are thinned for realization of physically compact design, and a step is provided on the reel table mounting section of the chassis by high-precision drawing process. A simplified figure of the drive mechanism is shown in Fig. 2-11 and Fig. 2-12. Power transmission to the pulley of the clutch mechanism section is done from the DD capstan motor via rubber belt.

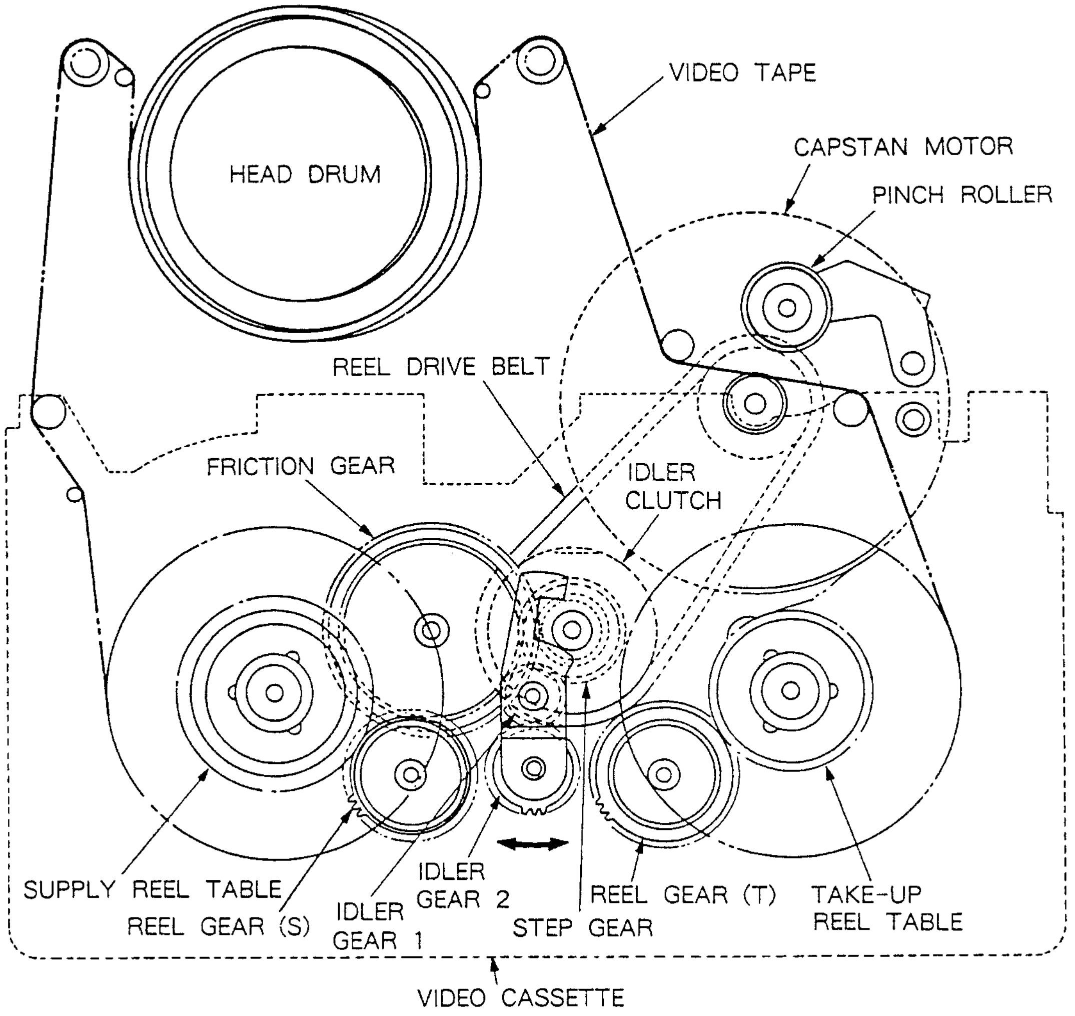

VIDEO TAPE
CAPSTAN MOTOR
PINCH ROLLER
HEAD DRUM
REEL DRIVE BELT
FRICTION GEAR
IDLER CLUTCH
SUPPLY REEL TABLE
REEL GEAR (S)
IDLER GEAR 1
IDLER GEAR 2
STEP GEAR
REEL GEAR (T)
TAKE-UP REEL TABLE
VIDEO CASSETTE

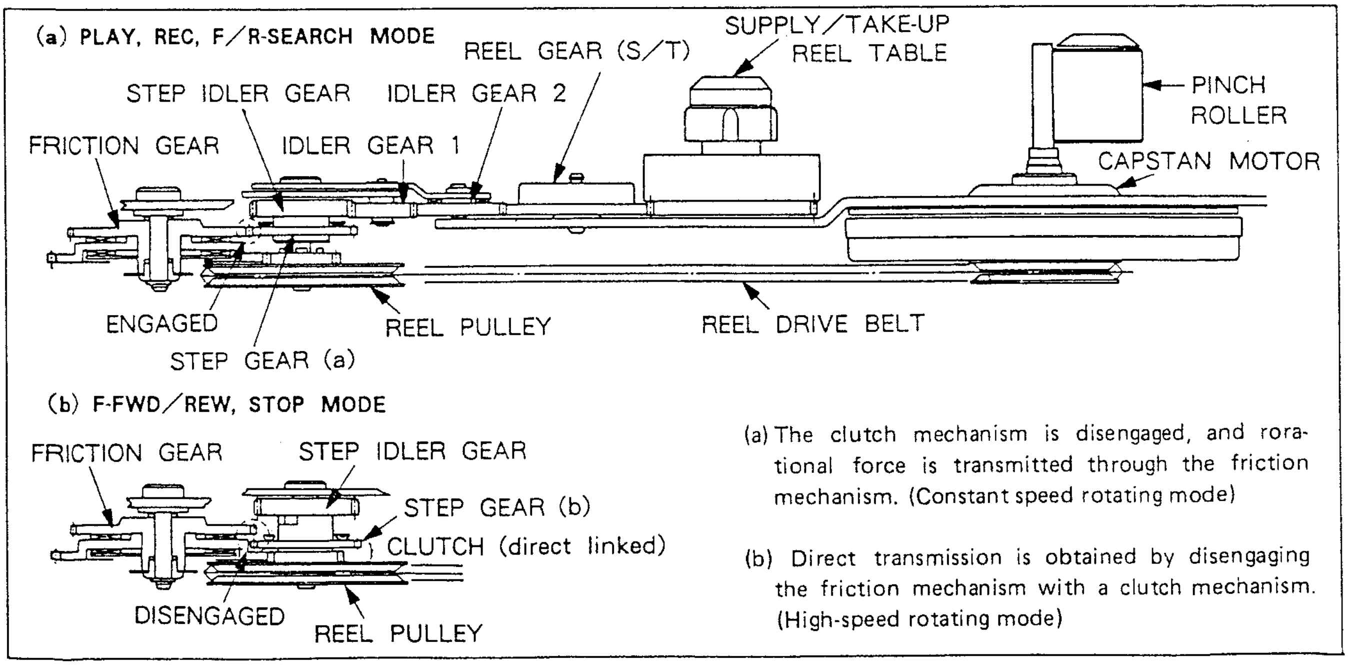
Fig. 2-11 REEL TABLE DRIVE

At that time, the reel table winding speed and the torque needed in a wide variety of modes are obtained by shifting the up and down STEP GEAR positioned at the upper section of pulley. The selection of the STEP GEAR is precision controlled by the MODE CAM GEAR via the BRAKE CONTROL SLIDE. With the up and down STEP GEAR down, the clutch mechanism is direct linked, and the transmission power from the capstan motor is sent to the reel table via IDLER GEAR assembly and REEL GEAR (S/T). On the other hand, FRICTION MECHANISM acts between the pulley and the STEP GEAR when the up and down STEP GEAR are in the elevated state, thereby controlling the transmission torque for generation of the take-up slip. Normally, it is desirable that the take-up torque of the reel table is higher in the R-SEARCH mode than that in the PLAY mode. This is because in the forward tape running the tape winding load to the HEAD DRUM has to be taken care of the capstan and the pinch roller.

While, in the reverse tape running mode the winding load has to be taken on the take-up reel table. In the special playback operation, a mechanism for varying the take-up torque of the reel table is required to be changed depending upon the running direction of the tape. But in this mechanism, the torque selection is made by varying the reduction speed ratio up to the reel table from the capstan motor on both the forward side and the reverse side of the tape. Also, design simplification of the selection mechanism is realized by using a single friction mechanism. In other words, the take-up torque necessary for forward/reverse rotation is obtained by controlling the capstan motor speed.

Rotation speed and torque needed for each mode of operation are converted by clutch mechanism for transmission of the drive power to the idler mechanism. The left and right moving IDLER GEAR assembly is automatically rotated to the left and the right according to the direction of capstan motor rotation by using the friction force. Because the mechanism is so designed as to drive the reel table of the side on which the tape is transported by the capstan and pinch roller, the forward and reverse constant speed drive (the PLAY, REC, F/R SEARCH modes) is carried out in the state in which the FRICTION MECHANISM is being operated (Fig. 2-12 ⓐ) On the other hand, in the condition in which the friction mechanism is not in operation, the forward/reverse high speed drive (FF/REW mode) is made possible (Fig. 2-12 ⓑ). Also, the reel drive in all modes is taken care of by the single left and right moving idler for design simplification.

The idler body employs gear drive to improve reliability with a view to realizing parts thinning while securing the transmission reliability. Using a resin molded gear as material of an idler, the efficiency of the entire reel drive system has been improved because there are no deformation and loss, and minimized rotation moving torque necessary for biting-in as in the case of a material such as rubber which shows considerable elastic deformation, etc. Further in this mechanism, an intermediate gear is provided in between the reel side and the idler to minimize the rotating and moving angle of the left and right moving idlers, thereby holding the reversing time to a minimum when shifting to the tape running direction change mode. This results in significantly reduced possibility of tape looseness.



(a) The clutch mechanism is disengaged, and rorational force is transmitted through the friction mechanism. (Constant speed rotating mode)

(b) Direct transmission is obtained by disengaging the friction mechanism with a clutch mechanism. (High-speed rotating mode)

Fig. 2-12 REEL TABLE DRIVE (SIDE VIEW)

2-3-2. Reel Table Drive Clutch Lock and Release Mechanism

As described in the preceding section, using the selection of the step gear (CLUTCH MECHANISM), two mechanisms which are driven by being selected via direct drive or via FRICTION MECHANISM from the capstan motor, to execute the reel table drive. The operating status of the clutch lock and the releasing mechanism is shown in Fig. 2-13.

Fig. 2-13 ① shows the tape unloading position (INITIAL position) when the power for the mechanism operating mode is switched off.

At that times all the levers are in the initial positions, and the clutch is released also so that a route for reel table drive is created via a friction mechanism.

Fig. 2-13 ② shows that the mechanism operation mode has executed the tape loading and that it has completed its movement to the STOP (stand-by), FF/REW position.

At this time, the CLUTCH ACT LEVER is operated by the hook of the ACT BRAKE SLIDE to move the ACT CLUTCH LEVER in the direction of arrow via the CLUTCH LEVER and the CLUTCH CHANGE LEVER. Now, the up and down STEP GEAR is placed into the direct coupled state. In the FF/REW mode, the reel table is directly driven so that the rotation of the capstan motor is directly transmitted to make high-speed rotation drive possible. When shifting the mode to the STOP from the FF/REW in this condition, the mechanism mode position is once moved back to the brake position, and when the reel table brake is instantaneously applied, the clutch is released once at the same time, after which it returns to the same mechanism mode as the FF/REW mode once again. Now, it is placed in a waiting state in the same condition of the STOP mode as shown in Fig. 2-13 ②.

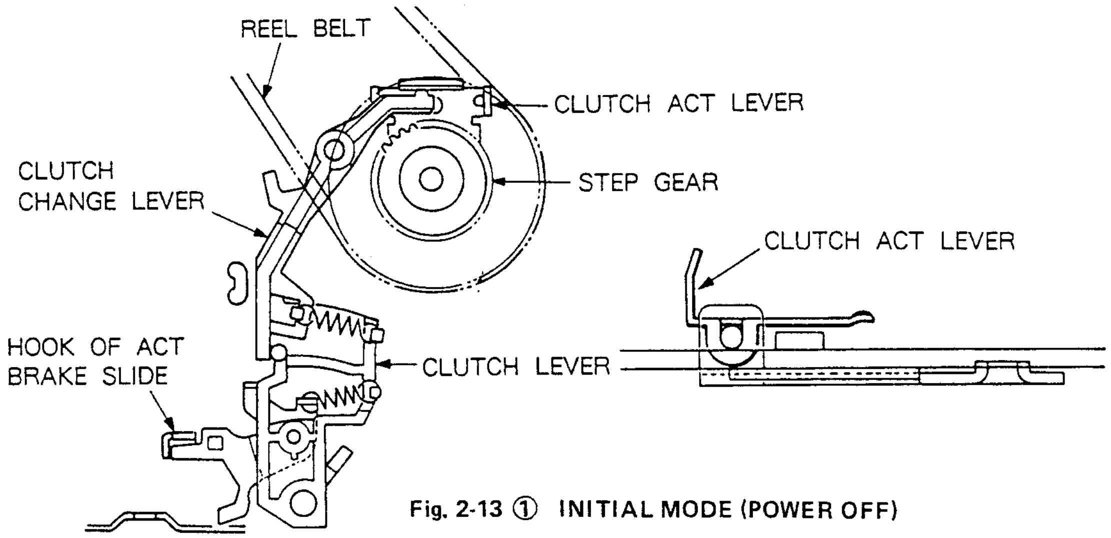

REEL BELT
CLUTCH ACT LEVER
STEP GEAR
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
HOOK OF ACT BRAKE SLIDE
CLUTCH LEVER

Fig. 2-13 ① INITIAL MODE (POWER OFF)

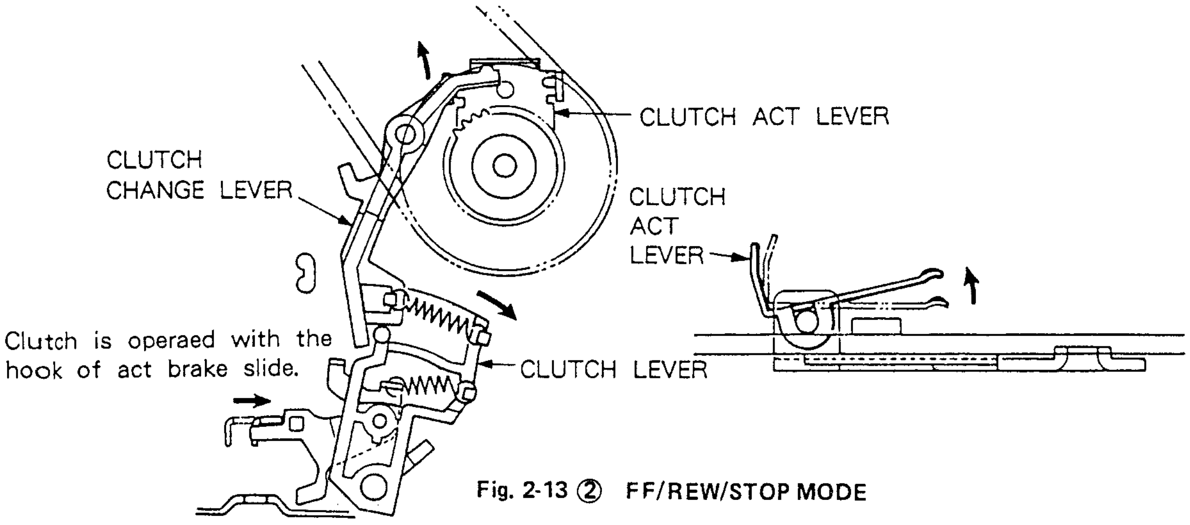

CLUTCH ACT LEVER
CLUTCH CHANGE LEVER
CLUTCH ACT LEVER
Clutch is operaed with the hook of act brake slide.
CLUTCH LEVER

Fig. 2-13 ② FF/REW/STOP MODE

Fig. 2-13 ① – ③ REEL TABLE DRIVE CLUTCH LOCK AND RELEASE MECHANISM

Fig. 2-13 ③ shows the completion state of a shift to the PLAY mode via the STILL mode from the STOP (FF/REW) mode for the mechanism mode position.
In the case of this mode shifting, the movement of the BRAKE ACT SLIDE remains fixed. So, the CLUTCH ACT LEVER should be unlocked by the movement of the hook of the MAIN SLIDE PLATE to cause the clutch to be released. This movement in turn causes the capstan motor rotation to be transmitted via the friction mechanism. So, the constant speed rotation drive necessary for the PLAY (REC) mode and SEARCH mode is made possible.

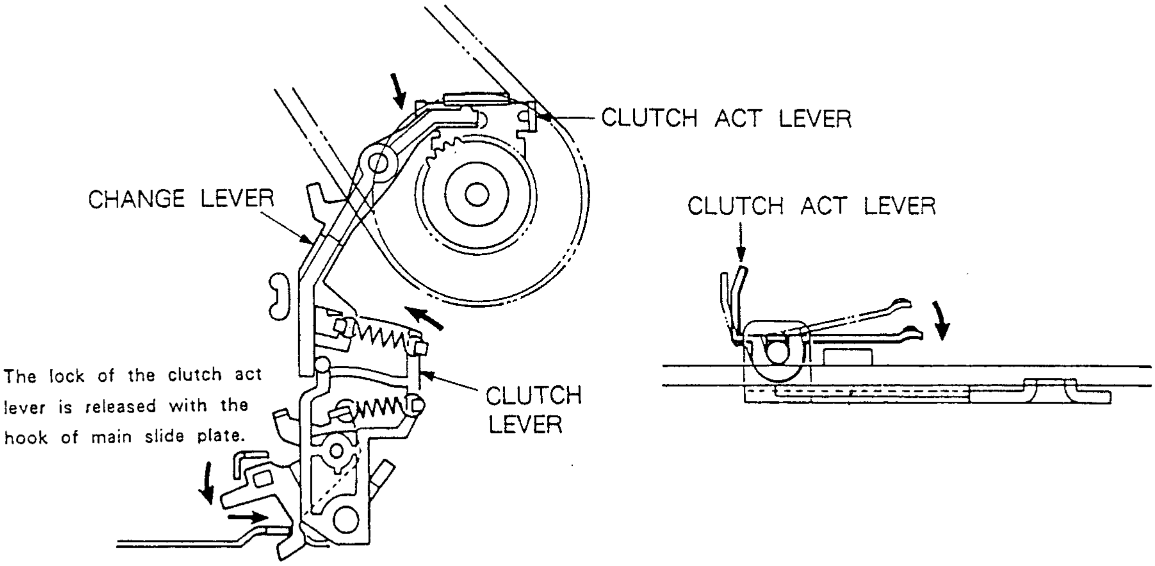

CLUTCH ACT LEVER
CHANGE LEVER
CLUTCH ACT LEVER
The lock of the clutch act lever is released with the hook of main slide plate.
CLUTCH LEVER

Fig. 2-13 ③ **FF/REW/STOP MODE → STILL MODE → PLAY MODE**

2-4. FRONT LOADING DRIVE SELECTION MECHANISM

In the P-90 mechanism, the motor dedicated to the use of front loading is not employed. The drive source is utilized instead of the tape loading motor. As shown in Fig. 2-14 ⓐ/ⓑ, during the front loading the FRONT LOAD WORM GEAR directly coupled to the tape loading motor axle and the FRONT HELICAL GEAR with several teeth missing are engaged with each other and rotated for transmission of the drive force to the front loading mechanism. When the cassette tape is inserted completely in the mechanism, the FRONT HELICAL GEAR is automatically disengaged from the FRONT LOAD WORM GEAR. After that, the tape loading operation is performed without the tape loading motor drive force being transmitted to the front loading mechanism.

While the drive force is being transmitted to the front loading mechanism, the CAM GROOVEs of the before-mentioned MAIN CAM GEAR and the MODE CAM GEAR are flat in cam line pattern. These are therefore held without changing the mode state of the mechanism in any way.

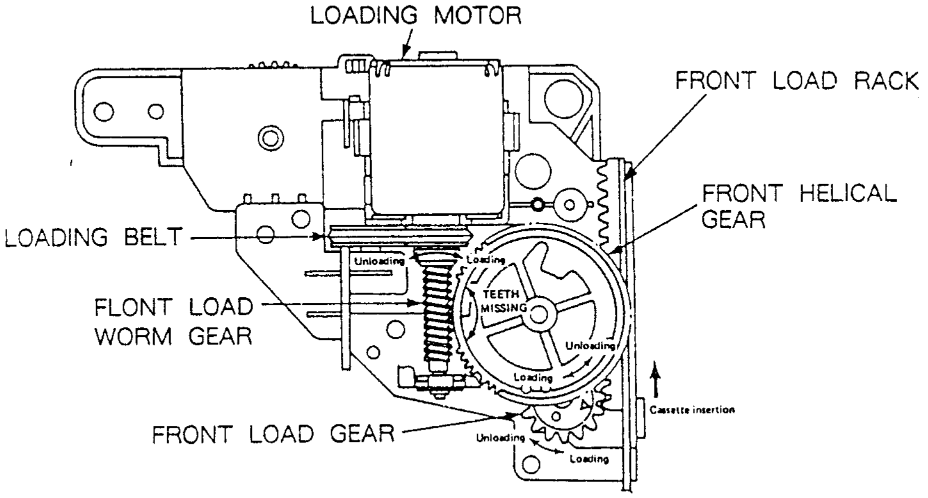

LOADING MOTOR
FRONT LOAD RACK
FRONT HELICAL GEAR
LOADING BELT
FLONT LOAD WORM GEAR
FRONT LOAD GEAR
Unloading
Loading
TEETH MISSING
Unloading
Loading
Cassette insertion
Unloading
Loading

Fig. 2-14 ⓐ FRONT LOADING DRIVE SELECTION MECHANISM (CASSETTE INSERTED POSITION)

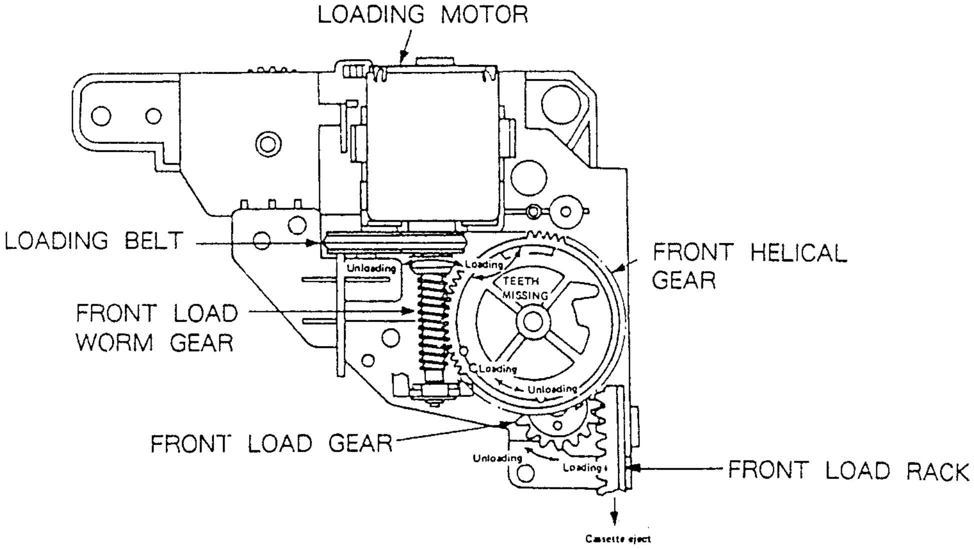

LOADING MOTOR
LOADING BELT
FRONT HELICAL GEAR
FRONT LOAD WORM GEAR
FRONT LOAD GEAR
FRONT LOAD RACK
Unloading
Loading
TEETH MISSING
Loading
Unloading
Unloading
Loading
Cassette eject

Fig. 2-14 ⓑ FRONT LOADING DRIVE SELECTION MECHANISM (CASSETTE EJECTED POSITION)

(A) Cassette inserting operation

When inserting a cassette from the cassette ejected state of Fig. 2-14 ⓑ, the FL START SWITCH shown in Fig. 2-15 is turned OFF, to cause the loading motor to be rotated in the direction of insetting. As a result, the FRONT LOAD RACK is drawn in, and the front loading is made up to the cassette tape completion point. So, it is locked in the grooves shown in Fig. 2-15 to complete cassette inserting. At that time, the FRONT HELICAL GEAR is positioned at ⓐ of Fig. 2-14, and is released from the front loading mechanism, therefore, the tape loading operation is continuously performed.

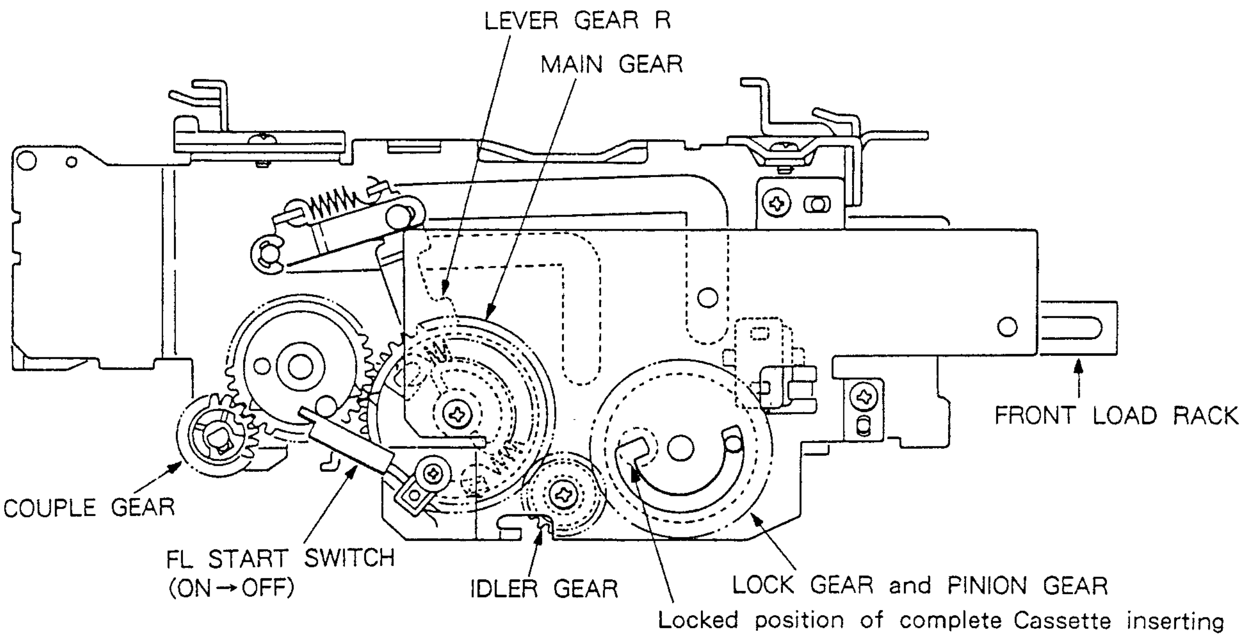

LEVER GEAR R
MAIN GEAR
FRONT LOAD RACK
COUPLE GEAR
FL START SWITCH
(ON→OFF)
IDLER GEAR
LOCK GEAR and PINION GEAR
Locked position of complete Cassette inserting

Fig. 2-15 CASSETTE HOLDER MECHANISM (CASSETTE INSERTING OPERATION)

(B) Cassette ejection operation

The components of the front loading mechanism is shown in Fig. 2-16.

When ejecting the cassette from the inserted state shown in Fig. 2-14 ⓐ, the FRONT ACT LEVER is pushed in the direction of arrow due to the ACT SLIDE PLATE moves in the direction of arrow shown in Fig. 2-17. As a result, the FRONT LEVER assembly is turned counterclockwise via the FRONT LOAD SLIDE to cause the FRONT HELICAL GEAR to be engaged with the FRONT LOAD WORM GEAR of the loading motor. At that time, the loading motor is being rotated counterclockwise, so that the FRONT HELICAL GEAR is caused to be rotated counterclockwise also to carry out the front unloading via the FRONT LOAD GEAR and the FRONT LOAD RACK. At the same time, the FRONT ACT LEVER is operated counterclockwise by the hook of the FRONT HELICAL GEAR. This releases the lock being pushed in the direction of arrow indicated by the ACT SLIDE PLATE. So, the FRONT LOAD SLIDE assembly now moves to the initial position to prepare for the next ejection operation. Incidentally, the movement of the FRONT LEVER assembly performs an important function of positioning the FRONT HELICAL GEAR (Fig. 2-14 ⓐ) upon completion of cassette mounting, in addition to the cassette eject start-up operation.

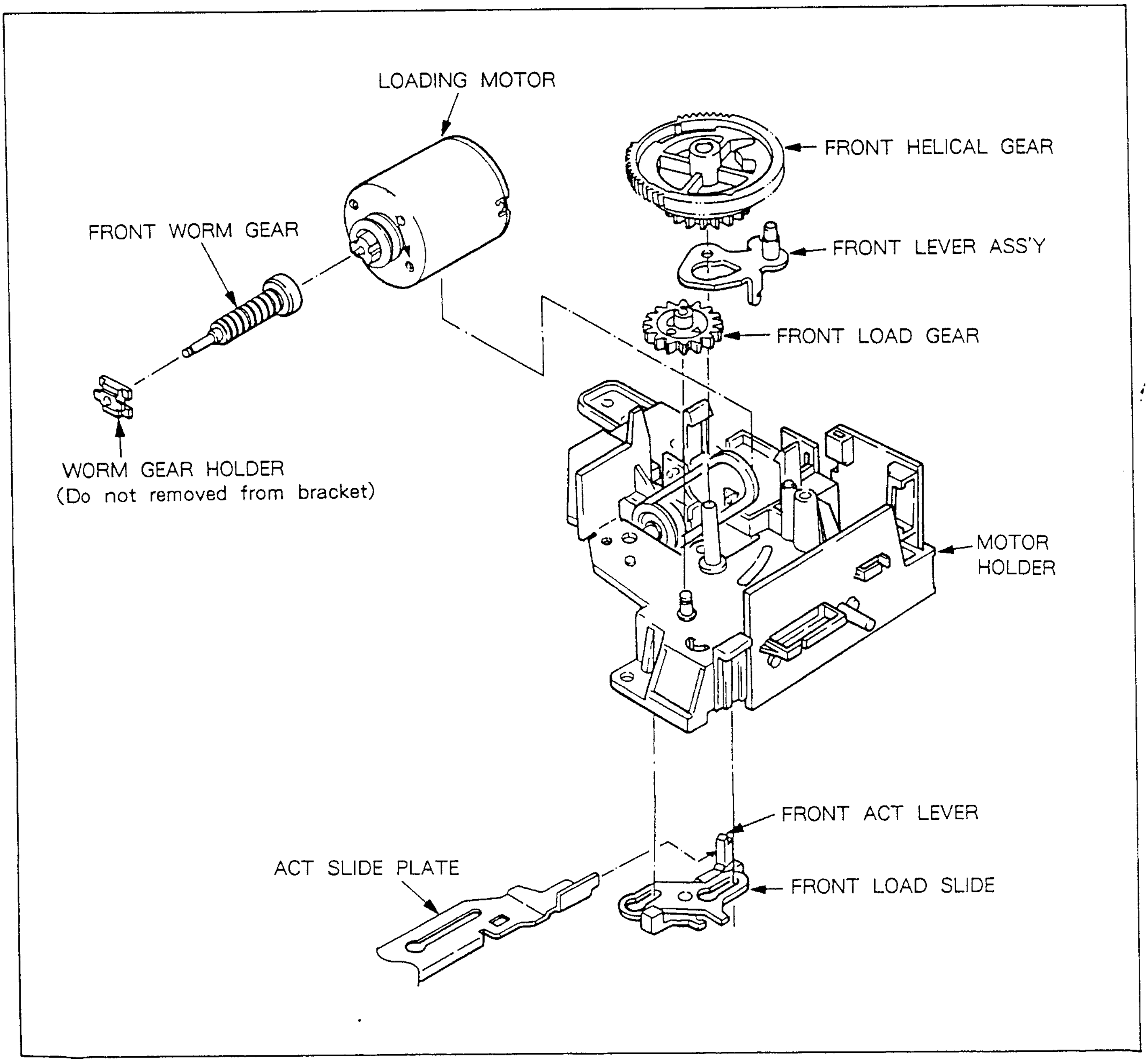
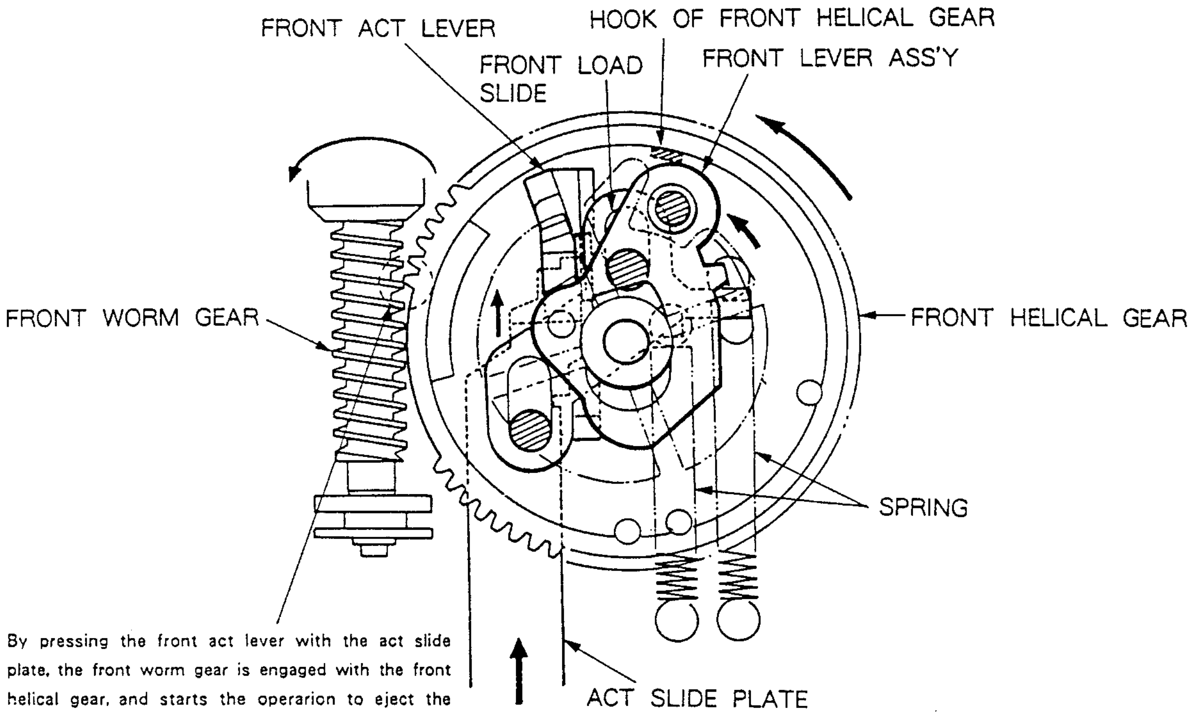

LOADING MOTOR
FRONT HELICAL GEAR
FRONT WORM GEAR
FRONT LEVER ASS'Y
FRONT LOAD GEAR
WORM GEAR HOLDER
(Do not removed from bracket)
MOTOR HOLDER
FRONT ACT LEVER
ACT SLIDE PLATE
FRONT LOAD SLIDE

Fig. 2-16 FRONT LOADING DRIVE SELECTION MECHANISM


FRONT ACT LEVER
HOOK OF FRONT HELICAL GEAR
FRONT LOAD SLIDE
FRONT LEVER ASS'Y
FRONT WORM GEAR
FRONT HELICAL GEAR
SPRING
ACT SLIDE PLATE

By pressing the front act lever with the act slide plate, the front worm gear is engaged with the front helical gear, and starts the operarion to eject the cassette.

Fig. 2-17 CASSETTE EJECTION START OPERATION (See through top view)

2-5. CASSETTE HOLDER MECHANISM

2-5-1. Components

The exploded view of the cassette holder mechanism is shown in Fig. 2-18. This mechanism consists of a cassette tray for feeding the cassette tape to the specified position of the mechanism chassis, a side plate provided with L type holes for supporting and guiding it, the top plate for regulating the width of left and right, and a group of gears for driving the cassette tray.

The entire mechanism is of independent construction apart from the mechanism body. The holder is fixed on the mechanism chassis by inserting the pawls at two points and tightening the setscrews at two points, or at a total of four points.

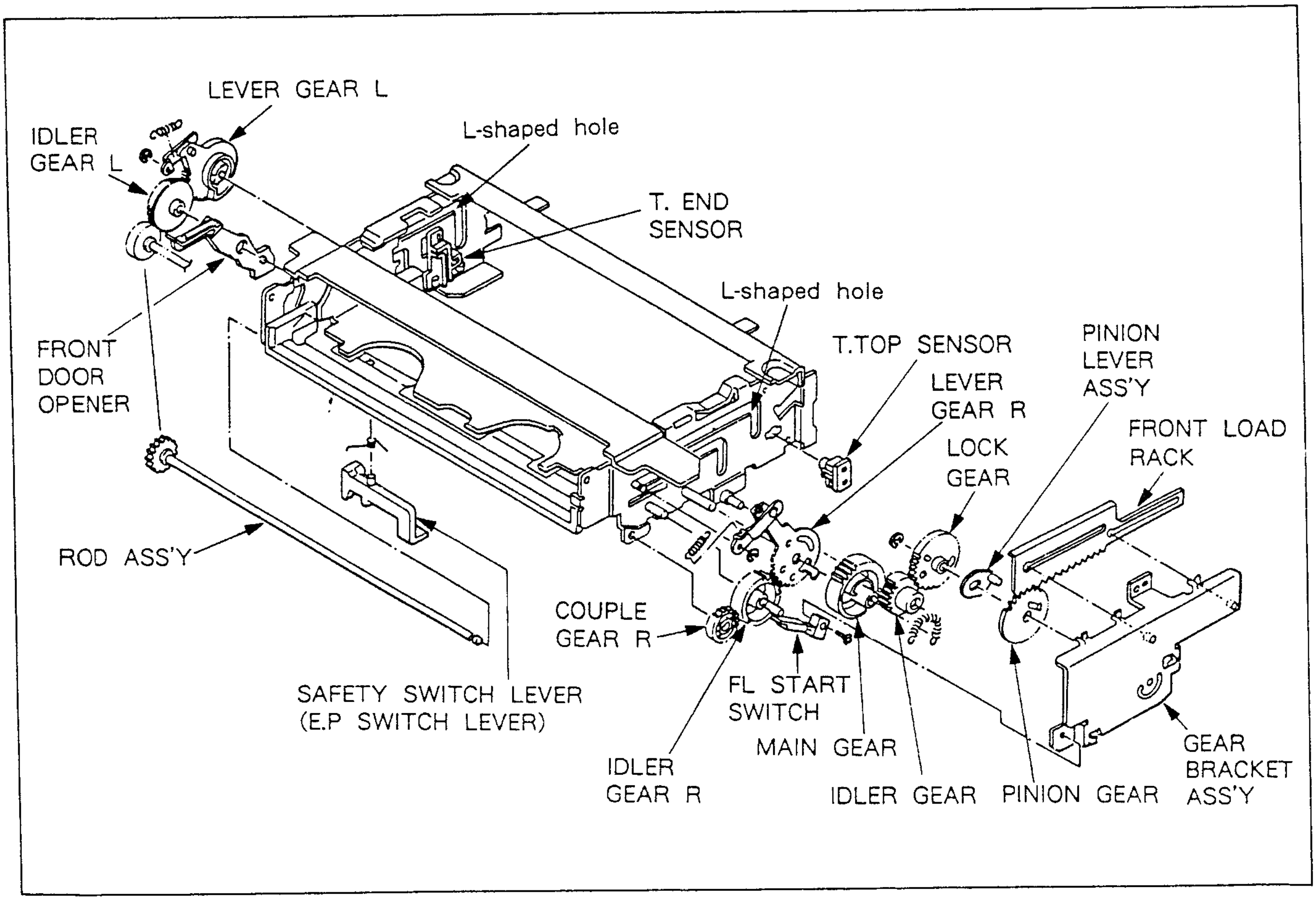

LEVER GEAR L
IDLER GEAR L
L-shaped hole
T. END SENSOR
L-shaped hole
FRONT DOOR OPENER
T.TOP SENSOR
PINION LEVER ASS'Y
LEVER GEAR R
FRONT LOAD RACK
LOCK GEAR
ROD ASS'Y
COUPLE GEAR R
SAFETY SWITCH LEVER (E.P SWITCH LEVER)
FL START SWITCH
MAIN GEAR
GEAR BRACKET ASS'Y
IDLER GEAR R
IDLER GEAR
PINION GEAR

Fig. 2-18 EXPLODED VIEW OF THE CASSETTE HOLDER MECHANISM

2-5-2. Description of Cassette Holder

The cassette holder is of motor-less design, as the lowering of mechanism height and driving source are done by the loading motor of the mechanism body.

As a substitute for the worm gear system hitherto used in the major drive section for the drive selection mechanism mentioned in section 2-4., the RACK LOADING system is adopted in this cassette holder mechanism. By this mechanism the motor-less design can be realized. An exploded view of the mechanism is shown in Fig. 2-19. A description of the operation is made below along with Fig. 2-19. To press-fit the cassette tape after sending it onto the mechanism chassis, the PINION GEAR section is triple construction. The FRONT LOAD RACK side and the IDLER GEAR side are independently engaged. The PINION GEAR and the LOCK GEAR are connected from the PINION LEVER PIN riveted to the PINION LEVER. Even after feeding the cassette tape to the specified position of the mechanism chassis, the FRONT LOAD RACK slides, giving the rotation to the PINION GEAR which is engaged with the FRONT LOAD RACK. At that time, a pin is dropped into the groove section provided on the GEAR BRACKET ASS'Y.

The other LOCK GEAR is fixed by this PINION LEVER PIN, and the cassette tape is press-fitted onto the mechanism chassis by linked IDLER GEAR. The before-mentioned FRONT LOAD RACK and the PINION GEAR are set free after dropping the PINION LEVER PIN into the groove section. So, the drive force of the loading motor is sent to the mechanism body.

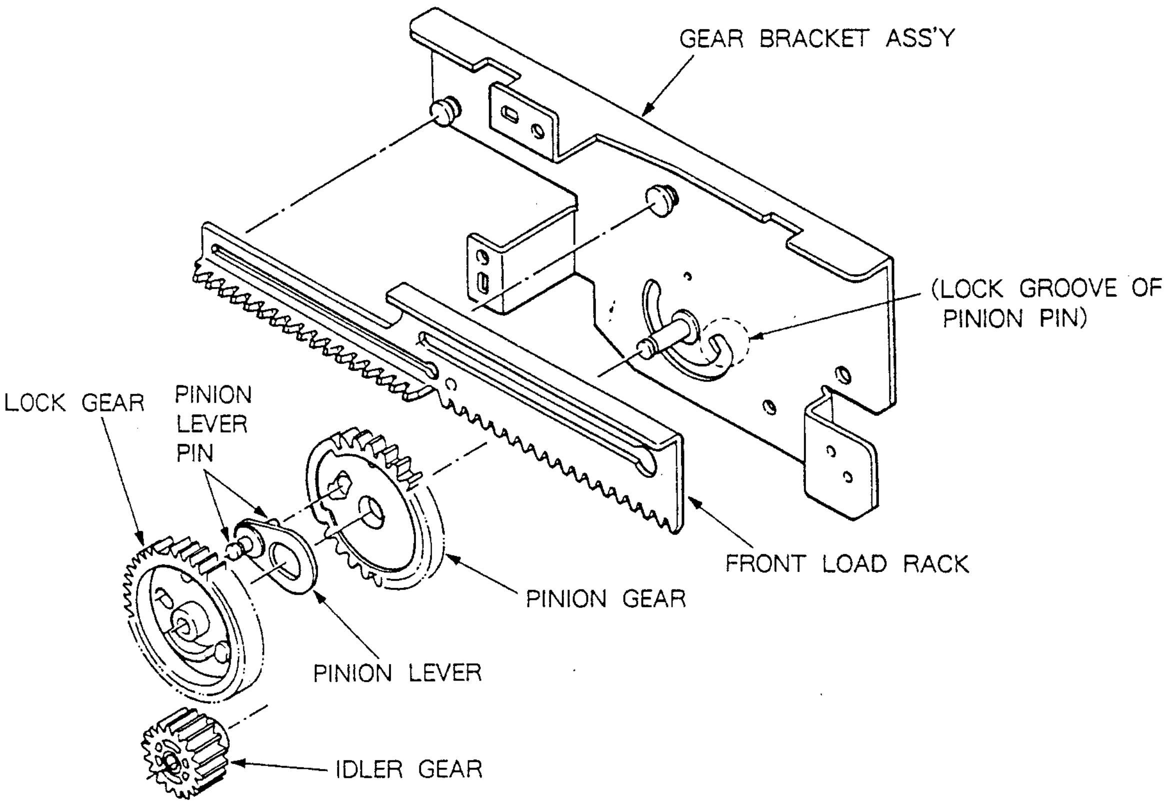


Fig. 2-19 RACK LOADING MECHANISM OF CASSETTE HOLDER

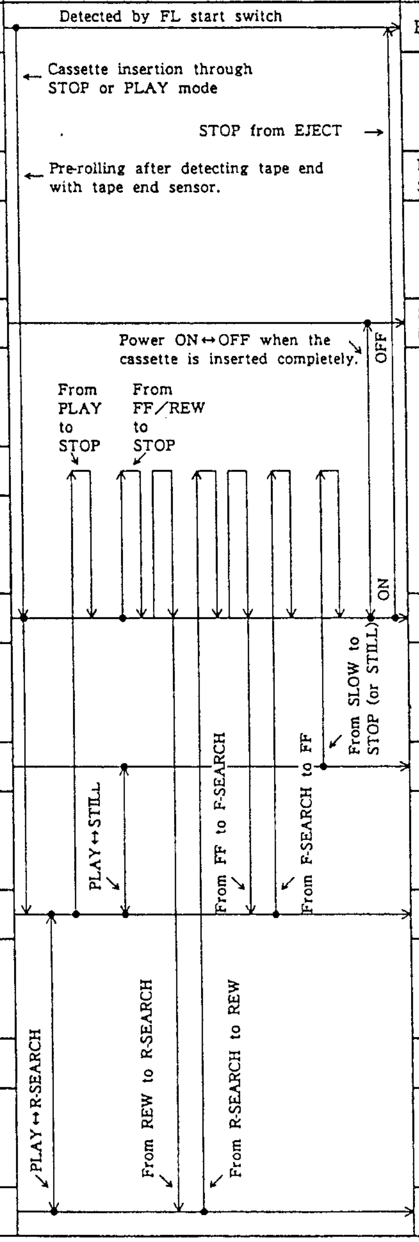
3. MECHANISM CONTROL

3-1. MODE ARRANGEMENT

This mechanism is arranged in such a mode layout as shown in Table. 3-1 and as described in section 2-1. The mode sensing switch described below is used for control of these modes.

3-2. MODE DETECTION SWITCH

For mode detecting one leaf switch (FL START SWITCH and one rotary switch (MECHANISM MODE SWITCH) are used in combination.

Mechanism Mode	Mechanism Mode Switch			HEX DATA	Function	Main Mode Shifting Conditions	VTR Operation Mode
	3	2	1				
EJECT	-	-	-		Eject position		EJECT
					Front loading/Unloading		
SHORT REW	-	-	-		Take up operation in the tape end position		Low side of ⑥. Sensed upon IN
INITIAL	1	1	1	⑦	Power off position		Power off when tape is loaded completely
					Tape unloading position Tape loading Tape loading ending position		
BRAKE	0	0	1	①	Main brake applying position		
STOP / FF/REW	0	1	0	②	STOP waiting and FF/REW (the head motor rotation)		STOP, FF/REW
STILL	0	1	1	③	The positions of STILL, SLOW or F-ADV.		STILL, SLOW, F-ADV
PLAY	1	0	0	④	From FWD direction Normal running mode		PLAY, REC, F-SEARCH
IDLER	1	0	1	⑤	Forward/reverse changeover position		PAUSE
REV	1	1	0	⑥	From REV direction Normal running mode		R-SEARCH

Detected by FL start switch
Cassette insertion through STOP or PLAY mode
STOP from EJECT
Pre-rolling after detecting tape end with tape end sensor.
Power ON↔OFF when the cassette is inserted completely.
OFF
ON
From PLAY to STOP
From FF/REW to STOP
From SLOW to STOP (or STILL)
PLAY↔STILL
From FF to F-SEARCH
From F-SEARCH to FF
PLAY↔R-SEARCH
From REW to R-SEARCH
From R-SEARCH to REW

Table 3-1

(1) Switch component

The mode switch consists of FL START SWITCH for detecting the cassette ejection and insertion, and MECHANISM MODE SWITCH for detecting the each mode position of the mechanism. As can be understood from Fig. 3-1, the MECHANISM MODE SWITCH rotates in excess of 360 degrees. Therefore, the sensing of a signal from the MECHANISM MODE SWITCH is done by the leaf switch.

In the P88 and P89 mechanisms, incidentally, short REW position is detected by the FL END SW, but in the P90 mechanism, the FL END SWITCH is not required due to a change in the internal structure of the MECHANISM MODE SWITCH.

(2) Mechanism mode switch

The mechanism mode switch consists of four terminals, namely, COM, DATA1, DATA2, and DATA3. These are processed as 3-bit signals for discrimination of seven modes.

The MECHANISM MODE SWITCH is not interchangeable with the hither to available black switch due to a change in its internal structure. Be sure therefore to use a blue switch.

3-3. CONSIDERATION TO FULL LOADING

① In the normal stop condition, the head drum is rotated to facilitate the start-up of the image at the time of playback, but it is conceivable that this is left undisturbed for an extended period of time. This may result in wear of the video head. For this reason, when five minutes elapse from the stop condition, the head drum stops rotating.

② To prevent the tape from being caught in the head drum due to dew forming, etc., the tape is housed in the unloaded cassette when turning the power off.

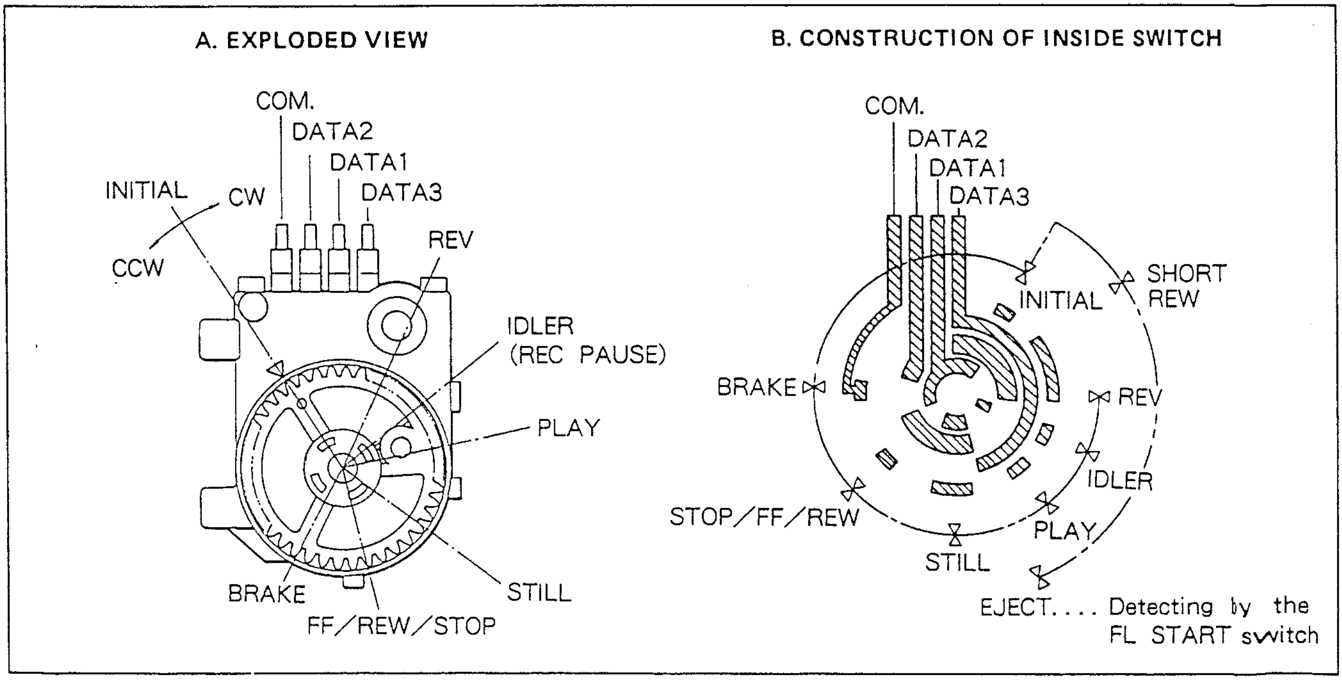

A. EXPLODED VIEW
COM.
DATA2
DATA1
DATA3
INITIAL
CW
CCW
REV
IDLER
(REC PAUSE)
PLAY
BRAKE
STILL
FF/REW/STOP
B. CONSTRUCTION OF INSIDE SWITCH
COM.
DATA2
DATA1
DATA3
SHORT REW
INITIAL
BRAKE
REV
IDLER
STOP/FF/REW
PLAY
STILL
EJECT.... Detecting by the FL START switch

Fig. 3-1 MECHANISM MODE SWITCH (ROTARY SWITCH)

4. MECHANISM MAINTENANCE AND CHECKING

4-1. PERIODIC CHECKING AND MAINTENANCE ITEMS AND SERVICE JIGS

The following maintenance and periodic checking procedures are recommended to ensure proper operation, and to protect the tape from dirt and damage. Also, these procedures should always be followed after repairing the unit.

4-1-1. Periodic Check Items

○ Cleaning ◎ Confirmation △ Lubrication

Part	Usage Time (hours)	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	Remarks
Tape Guide System	Tape running surfaces	○	○	○	○	○	○	○	○	○	○	
	ACE head	○	○	○	○	○	○	○	○	○	○	
	Drum (cylinder)	○	○	○	○	○	○	○	○	○	○	Head life depends heavily on operating conditions.
Drive System	Loading belt	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	
	Reel drive belt	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	
	Intermediate gear, pulley axles		△		△		△		△		△	Absolutely avoid oil on tape running surfaces.
	Capstan axles		△		△		△		△		△	
	Loading motor		◎		◎		◎		◎		◎	
Performance Check	Back tension torque		◎		◎		◎		◎		◎	47 ± 5 gcm
	Brake system		◎		◎		◎		◎		◎	
	FF, REV, PLAY torque		◎		◎		◎		◎		◎	FF : 600 gcm and over REW: 750 gcm and over REV : 150 to 240 gcm PLAY: 100 to 160 gcm

Note : The back tension torque is the value that has been measured by the cassette torque meter (VHJ-0016).
The torque of FF, REV, REW, and PLAY represent those measured with them locked by the torque gauge.
FF and REW are values 2 seconds after starting.

4-1-2. Cleaning

① Drum (COMPL CYLINDER) and Video Heads (See Fig. 4-1-1.)

1) Wrap a chamois leather around your finger and moisten it with methyl alcohol.
2) Move the chamois leather to left and right several times on the video head to clean. There is a video head also on the opposite side, so clean it likewise. In Hi-Fi models, clean the audio head also.
3) Clean the tape path surface of the cylinder in the same way.

Note: Always turn power off before cleaning. Do never move the chamois leather vertically or apply too much force to the head ; it may be damaged.

② Cleaning of the Tape Guide System (See Fig. 4-1-2.)

1) Set the EJECT mode and clean the tape guide system (tape guides, impedance roller, FTE head, ACE head, pinch rollers, capstan axles, etc.) with a chamois leather moistened with methyl alcohol.

Note: Make sure that no oil, grease, etc. adhere to the chamois leather and that heads are not damaged.

③ Cleaning of the Drive System

1) Clean the drive system (loading belt, reel drive belt, pulley, supply reel table, etc.) with a soft cloth moistened with methyl alcohol.

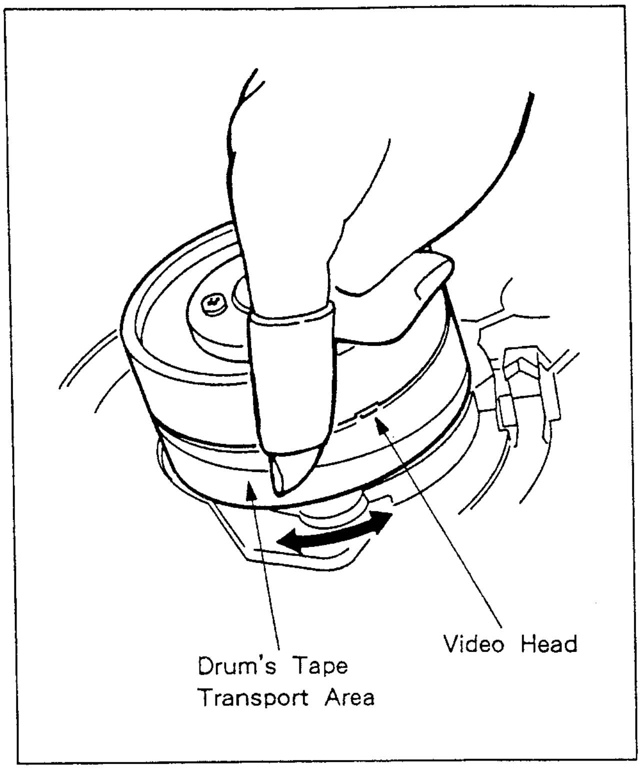

Drum's Tape
Transport Area
Video Head

Fig. 4-1-1.

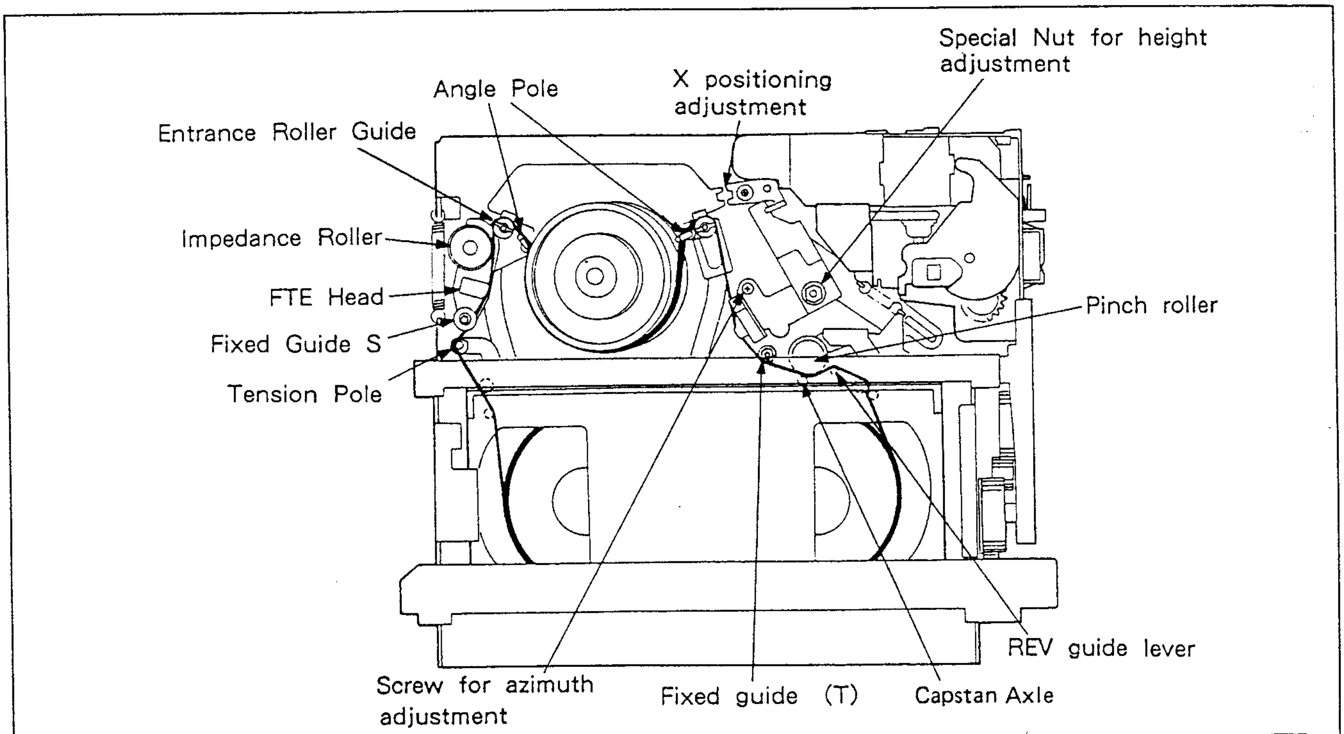
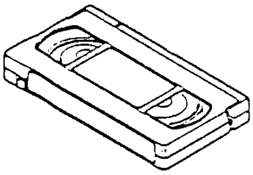

Special Nut for height adjustment
Angle Pole
X positioning adjustment
Entrance Roller Guide
Impedance Roller
FTE Head
Fixed Guide S
Tension Pole
Pinch roller
REV guide lever
Screw for azimuth adjustment
Fixed guide (T)
Capstan Axle

Fig. 4-1-2. Cleaning

4-1-3. Service Jigs

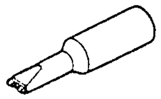
No.	Jig	Jig No.	Remarks
1	Alignment tape	VHJ-0008	SP color bar, 1kHz (normal)
2	Alignment tape	VHJ-0009	SP monoscope, 7kHz (normal)
3	Alignment tape	VHJ-0052	LP monoscope, 3kHz (normal)
4	Eccentric screwdriver	VHJ-0003	For tape path adjustment
5	Nut box	VHJ-0048	For tape path adjustment
6	Torque gauge	VHJ-0004	For reel take-up torque measurement
7	Cassette torquemeter	VHJ-0016	For back tension torque measurement
8	Position adjustment gauge	VHJ-0049	For position adjustment
9	Torque gauge screwdriver	VHJ-0014	For screw fastening torque adjustment
10	3mm dia. bit for torque screwdriver	VHJ-0045	Spare bit for the torque gauge screwdriver
11	Video head removing tool	VHJ-0041	For upper drum removal
12	Cassette stand plate gauge	VHJ-0001	For reel height adjustment
13	Mode selector	VHJ-0050	For mechanism mode selection
14	26-pin flexible flat cable	VHJ-0064	Spare cable for mode selector
15	Mode selector relay board	VHJ-0075	Relay board for mode selector
16	7-wire flat cable	VHJ-0076	Spare cable for relay board
17	REV guide lever removing tool	VHJ-0073	For REV guide lever removal
18	Fixed guide height gauge	VHJ-0053	For fixed guide (S) hight adjustment

VHJ-0008, VHJ-0009, VHJ-0052



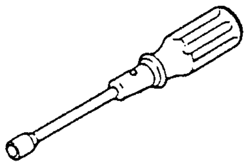
No. 1, 2, 3

VHJ-0003



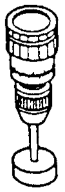
No. 4

VHJ-0048



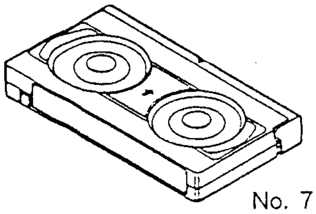
No. 5

VHJ-0004



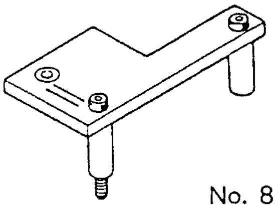
No. 6

VHJ-0016



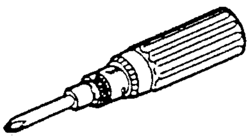
No. 7

VHJ-0049



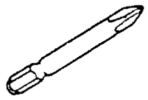
No. 8

VHJ-0014



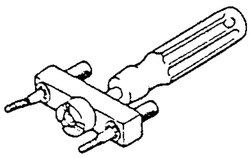
No. 9

VHJ-0045



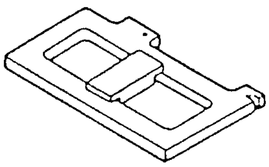
No. 10

VHJ-0041



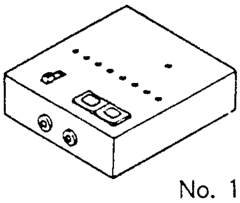
No. 11

VHJ-0001



No. 12

VHJ-0050



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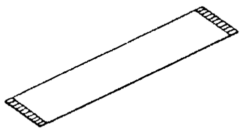
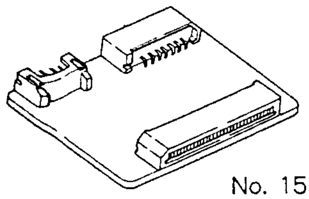
VHJ-0064



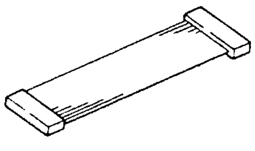
No. 14

VHJ-0075



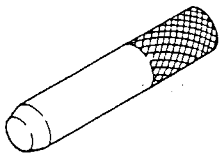
No. 15

VHJ-0076



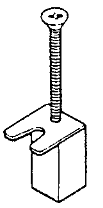
No. 16

VHJ-0073



No. 17

VHJ-0053



No. 18

4-2. MODE SELECTOR (VHJ-0050) HANDLING INSTRUCTIONS

The mode selector drives the loading motor of the P88 mechanism with its internal batteries (UM-2 × 4 = 6V), using LEDS to indicate the mode (EJECT, INITIAL, BRAKE, STOP/REW/FWD, STILL, PLAY, IDLER, REV) simultaneously with EJECT⇔REV mode changes.
Instead of the internal batteries, an external DC 6V power supply can also be used.

4-2-1. Part Names (See Fig. 4-2-1)

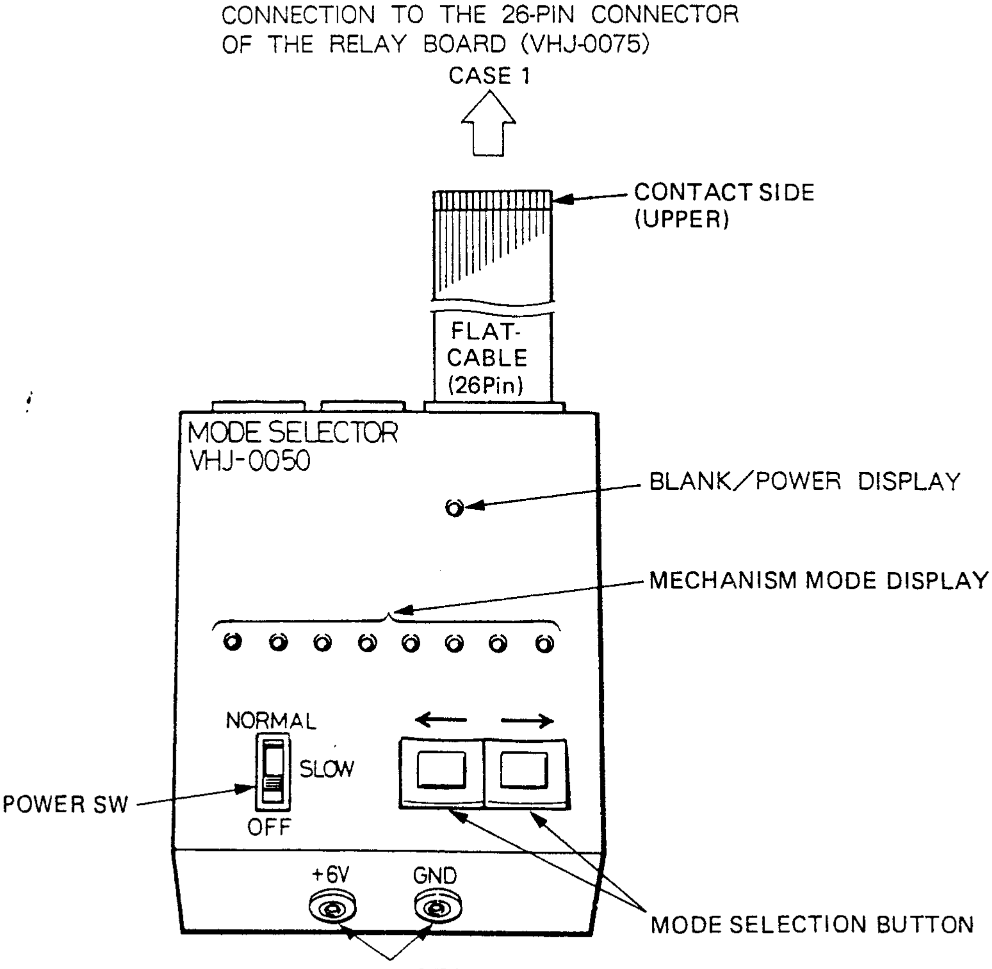

CONNECTION TO THE 26-PIN CONNECTOR
OF THE RELAY BOARD (VHJ-0075)
CASE 1
CONTACT SIDE
(UPPER)
FLAT-
CABLE
(26Pin)
MODE SELECTOR
VHJ-0050
BLANK/POWER DISPLAY
MECHANISM MODE DISPLAY
NORMAL
SLOW
OFF
POWER SW
+6V
GND
MODE SELECTION BUTTON
EXT. DC6V. INPUT TERMINAL

Fig. 4-2-1

4-2-2. Connection Method (See Fig. 4-2-2)

1) Remove the 7-wire cable connected from the system control circuit to the connector (CN822) of the MC-3 board.
2) Connect the 7-wire cable (VHJ-0076) between the connector (CN822) of the MC-3 board and the 7-pin connector of the Mode Selector Connection Board (VHJ-0075).
3) Remove the 6-wire cable extending from the cassette holder section from the connector of the System Control Circuit Board and connect it to the 6-pin connector of the Mode Selector Connection Board (VHJ-0075).
4) Connect a supplied 26-pin flat cable (VHJ-0064) of the mode selector (VHJ-0050) between the mode selector body and the 26-pin connector of the Connection Board (VHJ-0075).

Note : Care should be taken to avoid mistaking the direction of the contacting side when connecting a flexible flat cable.

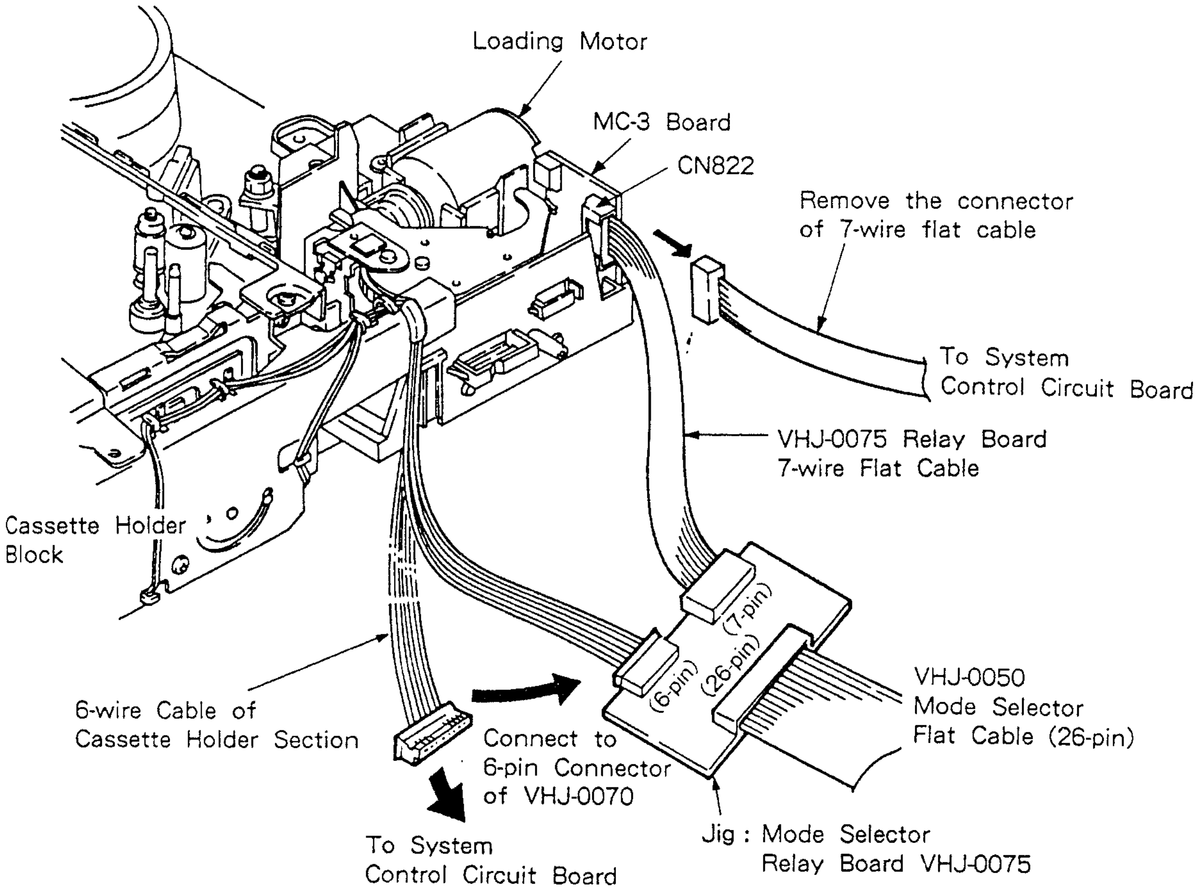

Loading Motor
MC-3 Board
CN822
Remove the connector of 7-wire flat cable
To System Control Circuit Board
VHJ-0075 Relay Board 7-wire Flat Cable
Cassette Holder Block
(7-pin)
(6-pin)
(26-pin)
VHJ-0050 Mode Selector Flat Cable (26-pin)
6-wire Cable of Cassette Holder Section
Connect to 6-pin Connector of VHJ-0070
To System Control Circuit Board
Jig : Mode Selector Relay Board VHJ-0075

Fig. 4-2-2 Connection

4-2-3. Handling Method

1) Keep the right side (⇨) of the mode selector key pressed, and the mode will change in the following sequence : EJECT⇨INITIAL⇨BRAKE⇨STOP／REW／FWD⇨STILL⇨PLAY⇨IDLER⇨REV.
2) When changing the mode in the REV···⇨EJECT direction, press the left side (⇦) of the mode selector key until the desired mode is indicated.
3) In the mid position of each mode during a shift to other mode, the "BLANK" LED lights. But the "PLAY", "IDLER", "REV" LEDs light between the EJECT mode and the INITIAL mode. Be sure therefore to check the mechanism body to see just what state the mechanism is in.
   Incidentally, if the mode selector is not connected to the mechanism, the "BLANK" LED lights to indicate the power ON.
4) The SLOW position of POWER switch makes relatively slow motions in comparison with the NORMAL position.

Note 1 : The mode selector drives the loading motor only, not affecting the head drum motor and the capstan motor. When using the mode selector with a cassette loaded, turn the capstan motor manually to remove tape slackness, preventing tape entanglement.

Note 2 : If the left side (⇦) of the mode selector (VHJ-0050) key is kept pressed with the COMPL cassette mechanism removed, it might get past the EJECT position, causing the front helical gear and the front worm gear to get disengaged.

In this condition, since the front helical gear will not turn even if the right side (⇨) of the mode selector key is pressed, rotate (push) the front helical gear clockwise by hand and engage it with the front worm gear. In this condition, as there is a misalignment between the mechanism main body operation mode (indicated by the mode selector indicator lamps) and the front loading mechanism operation mode, keep the right side (⇨) of the mode selector key pressed until the front helical gear and the front loading gear of the front loading mechanism get back to the initial condition (Refer to A and B in Fig. 4-5-5 of section 4-5-2. Loading Motor).

When the front loading mechanism returns to the initial condition, operation mode of the whole mechanism gets back to normal, matching the mode shown by the mode selector indicator lamps (mode is not properly indicated, however, during EJECT to INITIAL).

Sometimes, engagement of the front helical gear with the front worm gear is delayed, operation mode of the mechanism main body gets too much ahead and the front loading mechanism mode cannot be switched to the initial condition. In that case, press the left side (⇦) of the mode selector key, setting the mechanism main body operation mode back to EJECT (rotation of the mode cam and the MAIN CAM stops).

Note 3 : The mode selector indicator lamps show the mechanism operation mode, but the EJECT lamp may sometimes fail to indicate the actual mechanism operation mode.

5. MECHANISM DISMANTLING AND REASSEMBLING

5-1. MECHANISM MAIN UNIT (See Fig. 5-1-1.)

1. Removal

1) Remove the connectors of the COMPL MC-3 and the COMPL HEAD BRACKET.
2) Remove the flexible cable ① connecting the COMPL CYLINDER to the PRE-AMP UNIT ③ (See Fig. A).
3) Remove the two screws ②, then remove the PRE-AMP UNIT ③.
4) Remove the screw ④, then remove the PRE-AMP. BRACKET ⑤.
5) Remove the two screws ⑥.
6) Remove the three screws ⑦ and two screws ⑩, then lift up the mechanism main unit and remove it.
   Since the TRAY ⑧ obstructs removal of the two front screws ⑩, move the TRAY LOCK LEVER ⑨ in the direction of the arrow to unlock, then slide the TRAY ⑧ before removing the screws. (See Fig. B)

Note : Shape of the PRE-AMP UNIT ③ and the PRE-AMP. BRACKET ⑤ differ depending on the model.

2. Remounting

1) Mount the mechanism main unit onto the chassis with the three screws ⑦ and two screws ⑩.
2) Tighten the two screws ⑥.
3) Mount the PRE-AMP. BRACKET ⑤ with the two screws ④.
4) Mount the PRE-AMP UNIT ③ and the ground lug with the two screws ② (some models are not provided with a ground lug).
5) Insert the flexible cable ① into the connector of the PRE-AMP UNIT.
6) Connect the connectors of COMPL MC-3 and COMPL HEAD BRACKET.

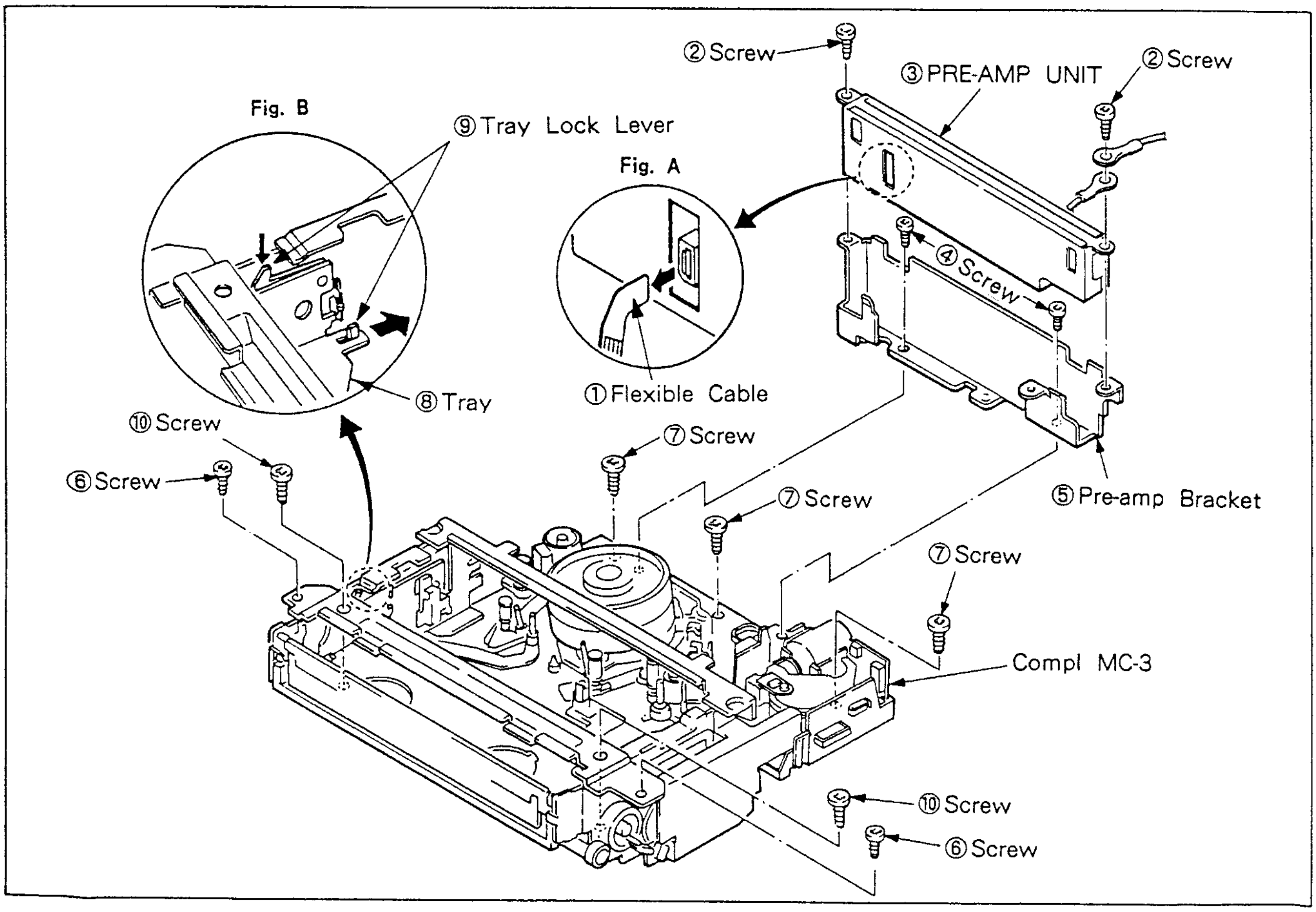

②Screw
③PRE-AMP UNIT
②Screw
Fig. B
⑨Tray Lock Lever
Fig. A
④Screw
⑧Tray
①Flexible Cable
⑩Screw
⑦Screw
⑥Screw
⑦Screw
⑤Pre-amp Bracket
⑦Screw
Compl MC-3
⑩Screw
⑥Screw

Fig. 5-1-1 Mecahnism Main Unit

5-2. CASSETTE HOLDER MECHANISM

5-2-1. COMPL Cassette Mechanism (See Fig. 5-2-1.)

1. Removal

1) Set the video main unit to the EJECT completed mode.
2) Pull out the connectors (6-PIN CONNECTOR connected to the system control circuit board, ACE HEAD CONNECTOR, and FTE HEAD CONNECTOR) from CASSETTE HOLDER.
3) Remove the two screws ①.
4) Remove the two screws ②.
5) Lift up the COMPL CASSETTE MECHANISM ④ back a little and remove the two hooks ③ on the front (See Fig. B). When doing so, make sure that the SAFETY SWITCH LEVER is not caught by the mechanism chassis.

2. Remounting

1) Set the chassis section mechanism to the EJECT mode with the mode selector (VHJ-0050) (looking from above, match the front loading gear hole ⑤ with the MOTOR HOLDER hole ⑥ as shown in Fig. A).
2) Set the COMPL CASSETTE MECHANISM ④ to the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM ④ onto the mechanism chassis, aligning it with the protuberance.
   Match positions of the FRONT LOADING GEAR △ mark ⑦ and the RACK EJECT mark ⑧. (See Fig. A.)
4) Fix to the mechanism chassis with the two screws ②.
5) Fix to the chassis with the screw ①.
6) Connect to the various connectors.

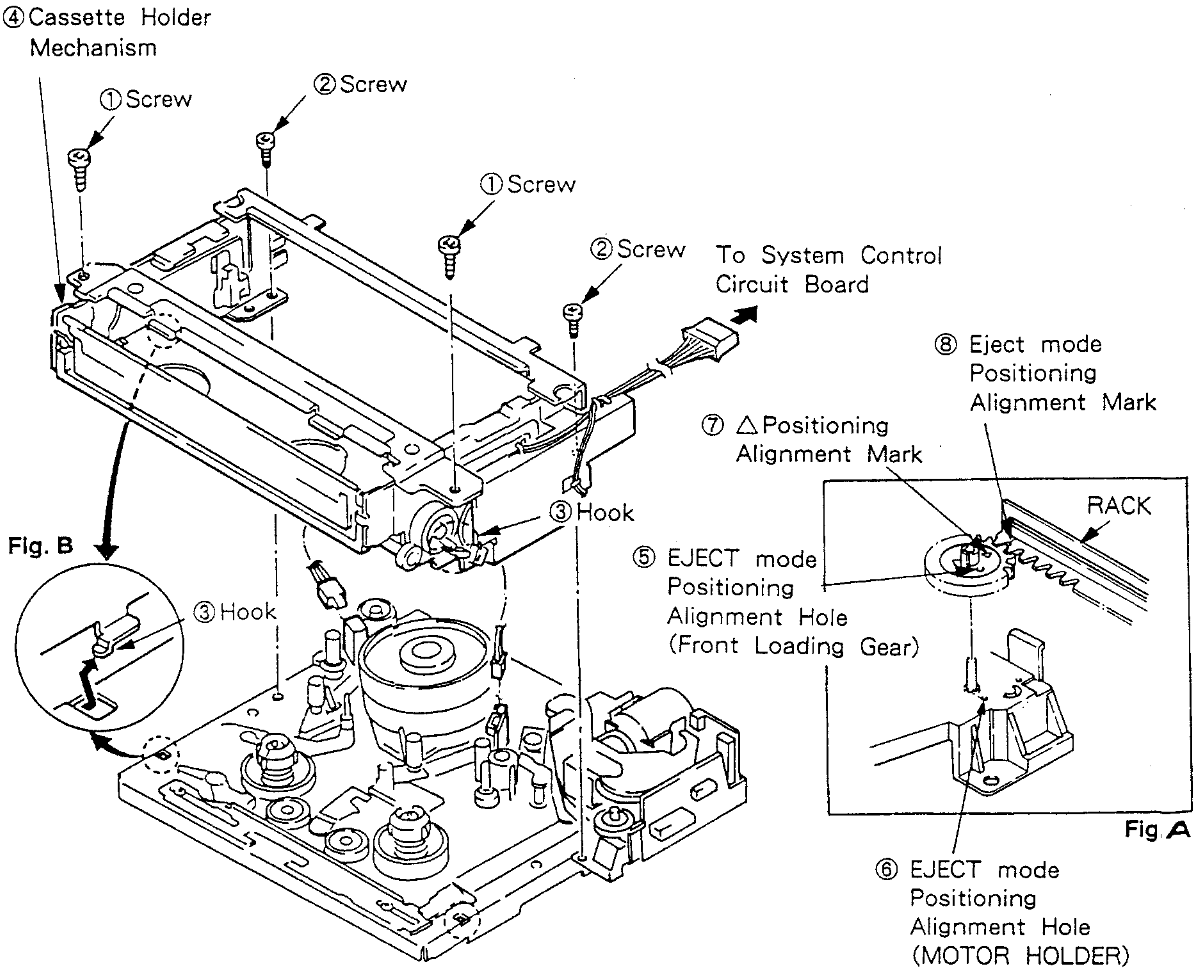

④Cassette Holder Mechanism
①Screw
②Screw
①Screw
②Screw
To System Control Circuit Board
⑧ Eject mode Positioning Alignment Mark
⑦ △Positioning Alignment Mark
RACK
③Hook
Fig. B
③Hook
⑤ EJECT mode Positioning Alignment Hole (Front Loading Gear)
Fig.A
⑥ EJECT mode Positioning Alignment Hole (MOTOR HOLDER)

Fig. 5-2-1 Compl Cassette Mechanism

5-2-2. Gear Bracket Ass'y (See Fig. 5-2-2.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the four screws ①, then remove the GEAR BRACKET ASS'Y ②.
3) Remove the E ring ③, then remove the LOCK GEAR ④, the PINION LEVER ASS'Y ⑤, the PINION GEAR ⑥ and the RACK ⑦, in that order.

2. Remounting

1) Apply grease to the shaft ⑧ and the two pins ⑨ of the GEAR BRACKET ASS'Y.
2) Apply grease to the pin ⑩ of the PINION LEVER ASS'Y.
3) Apply grease to the toothed part of the RACK ⑦.
4) Fit the RACK ⑦ onto the two pins ⑨. Match position of the hole ⑪ to the GEAR BRACKET hole ⑫.
5) Mount the PINION GEAR ⑥, PINION LEVER ASS'Y ⑤, and LOCK GEAR ④ in the shaft ⑧ in the order mentioned.
   Set the hole ⑬ of the PINION GEAR and the LOCK GEAR with the hole ⑪ of the RACK for proper positioning at that time.
6) Mount them in E-ring shaft.
7) Set the GEAR BRACKET ASS'Y ② to the dowel and mount it using four screws ①.
   Set the hole Ⓐ of the IDLER GEAR with the hole Ⓑ of the SIDE BOARD as shown in Fig. 5-2-3 at this time.
   Also set the hole ⑬ of the PINION GEAR and the LOCK GEAR with the hole ⑫ of the GEAR BRACKET by referring to Fig. 5-2-2. After mounting them, check to be sure that FL START SWITCH ⑭ is in the ON state shown in Fig. A.
8) Remount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

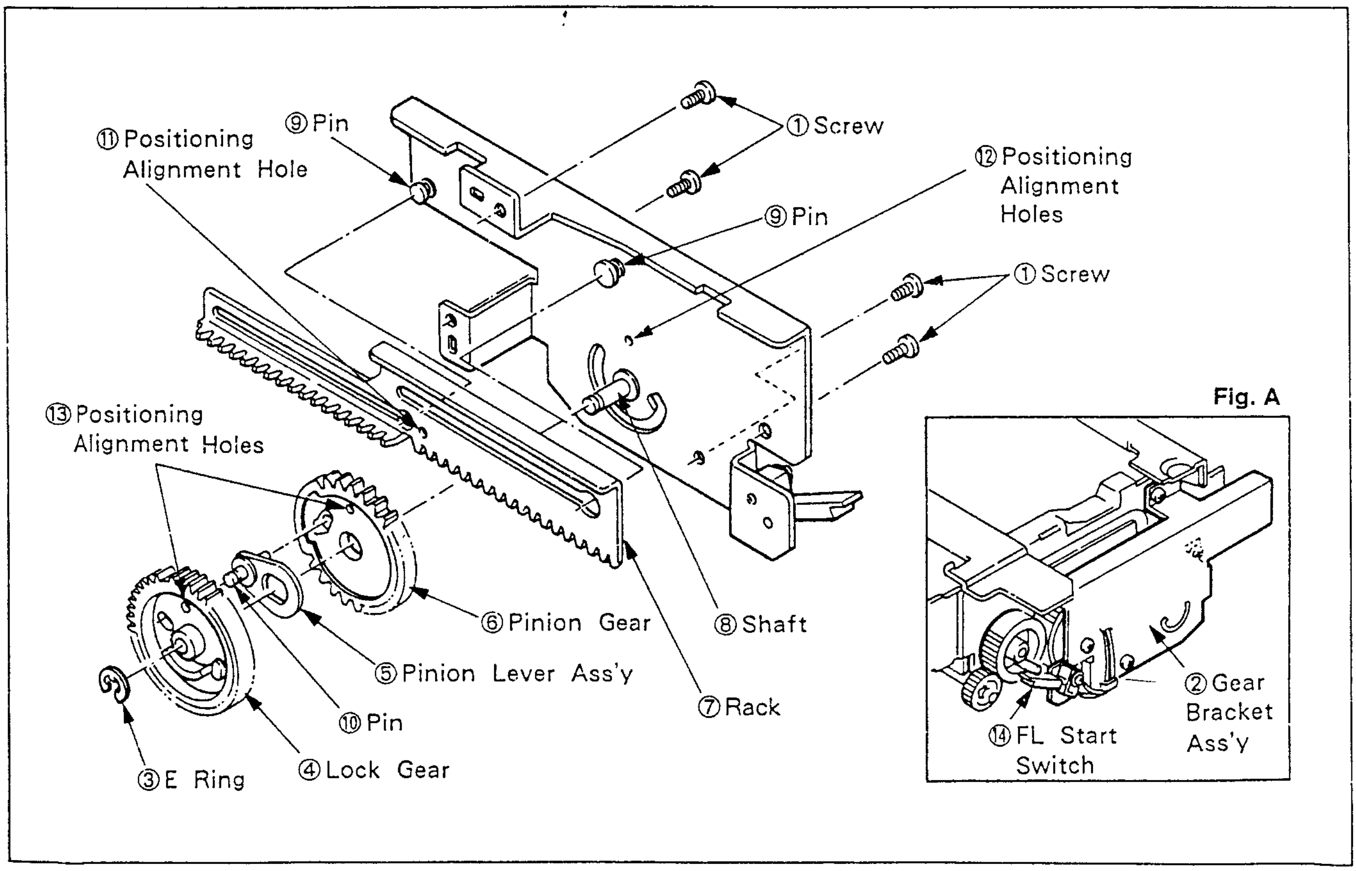

⑪Positioning Alignment Hole
⑨Pin
①Screw
⑫Positioning Alignment Holes
⑨Pin
①Screw
⑬Positioning Alignment Holes
⑥Pinion Gear
⑧Shaft
⑤Pinion Lever Ass'y
⑦Rack
⑩Pin
③E Ring
④Lock Gear
Fig. A
②Gear Bracket Ass'y
⑭FL Start Switch

Fig. 5-2-2. Gear Bracket Ass'y

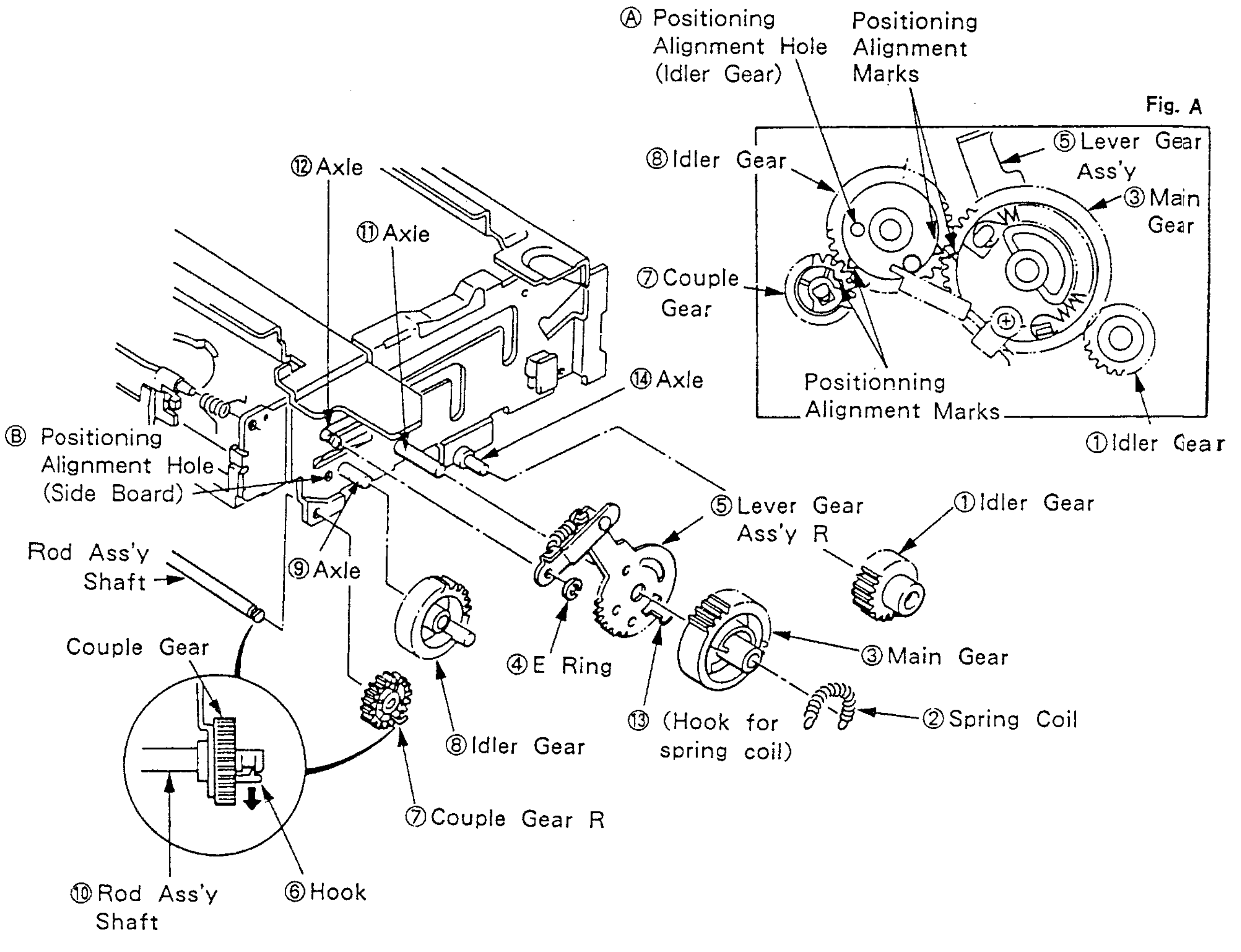
5-2-3. Cassette Drive Gear (Right) (See Fig. 5-2-3.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM and the GEAR BRACKET ASS'Y as instructed in 5-2-1. and 5-2-2., respectively.
2) Remove the IDLER GEAR ①.
3) Remove the SPRING COIL ②, then remove the MAIN GEAR ③.
4) Remove the E ring ④, then remove the LEVER GEAR ASS'Y R ⑤.
5) Open the hook ⑥ and remove the COUPLE GEAR R ⑦. Take care not to open the hook ⑥ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the IDLER GEAR R ⑧.

2. Remounting

1) Apply grease to gear parts that undergo friction.
2) Mount the IDLER GEAR R ⑧ onto the axle ⑨.
3) Mount the COUPLE GEAR R ⑦ onto the ROD ASS'Y axle ⑩. When doing so, match the couple gear position with the IDLER GEAR R ⑧ as shown in Fig. A.
4) Mount the LEVER GEAR ASS'Y R ⑤ onto the axles ⑪ and ⑫. Match position to the IDLER GEAR R ⑧ as shown in Fig. A.
5) Mount the E ring ④ onto the axle ⑫.
6) Mount the MAIN GEAR ③ onto the axle ⑪. When doing so, match position to the IDLER GEAR R ⑧ as shown in Fig. A.
7) Hook the SPRING COIL ② to the notch ⑬ in the MAIN GEAR R ③ and the LEVER GEAR ASS'Y R.
8) Mount the IDLER GEAR ① onto the axle ⑭. When doing so, match position to the MAIN GEAR as shown in Fig. A.
9) Mount the GEAR BRACKET ASS'Y and the COMPL CASSETTE MECHANISM ASS'Y as instructed in 5-2-2. and 5-2-1., respectively.



Ⓐ Positioning Alignment Hole (Idler Gear)
Positioning Alignment Marks
Fig. A
⑤Lever Gear Ass'y
③Main Gear
⑧Idler Gear
⑦Couple Gear
Positionning Alignment Marks
①Idler Gear
⑫Axle
⑪Axle
⑭Axle
Ⓑ Positioning Alignment Hole (Side Board)
Rod Ass'y Shaft
⑨Axle
Couple Gear
⑤Lever Gear Ass'y R
①Idler Gear
④E Ring
③Main Gear
⑬ (Hook for spring coil)
②Spring Coil
⑧Idler Gear
⑦Couple Gear R
⑩Rod Ass'y Shaft
⑥Hook

Fig. 5-2-3. Cassette Drive Gears (Right Side)

5-2-4. Cassette Drive Gear (Left) (See Fig. 5-2-4)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COUPLE GEAR R as instructed in 5-2-3.
3) Remove the ROD ASS'Y ①.
4) Remove the E ring ②.
5) Remove the hook ③, then remove the LEVER GEAR ASS'Y L ④. Take care not to open the hook ③ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the SPRING COIL ⑤ from the LEVER GEAR ASS'Y ④.
7) Remove the IDLER GEAR L ⑥ and the DOOR OPEN LEVER ⑦.

2. Remounting

1) Apply grease to the axles ⑧, ⑨ and ⑩.
2) Apply grease to the IDLER GEAR L ⑥.
3) Mount the DOOR OPEN LEVER ⑦ onto the axle ⑧. Do it so that the end of the DOOR OPEN LEVER ⑦ leans against the front side of the CASSETTE DOOR ⑪ as shown in Fig. A.
4) Mount the IDLER GEAR L ⑥ onto the axle ⑧.
5) Pass the ROD ASS'Y ① through the hole ⑫. Match position of the COUPLE GEAR L ⑬ and the IDLER GEAR L ⑥ as shown in Fig B.
6) Mount the COUPLE GEAR R as instructed in 5-2-3.
7) Hook the SPRING COIL ⑤ to the LEVER GEAR ASS'Y L ④.
8) Mount the LEVER GEAR ASS'Y L ④ onto the axle ⑨ and the shaft ⑩. Match position to the IDLER GEAR L ⑥ as shown in Fig. B.
9) Mount the COMPL CASSETTE MECHANISM onto the chassis as instructed in 5-2-1.

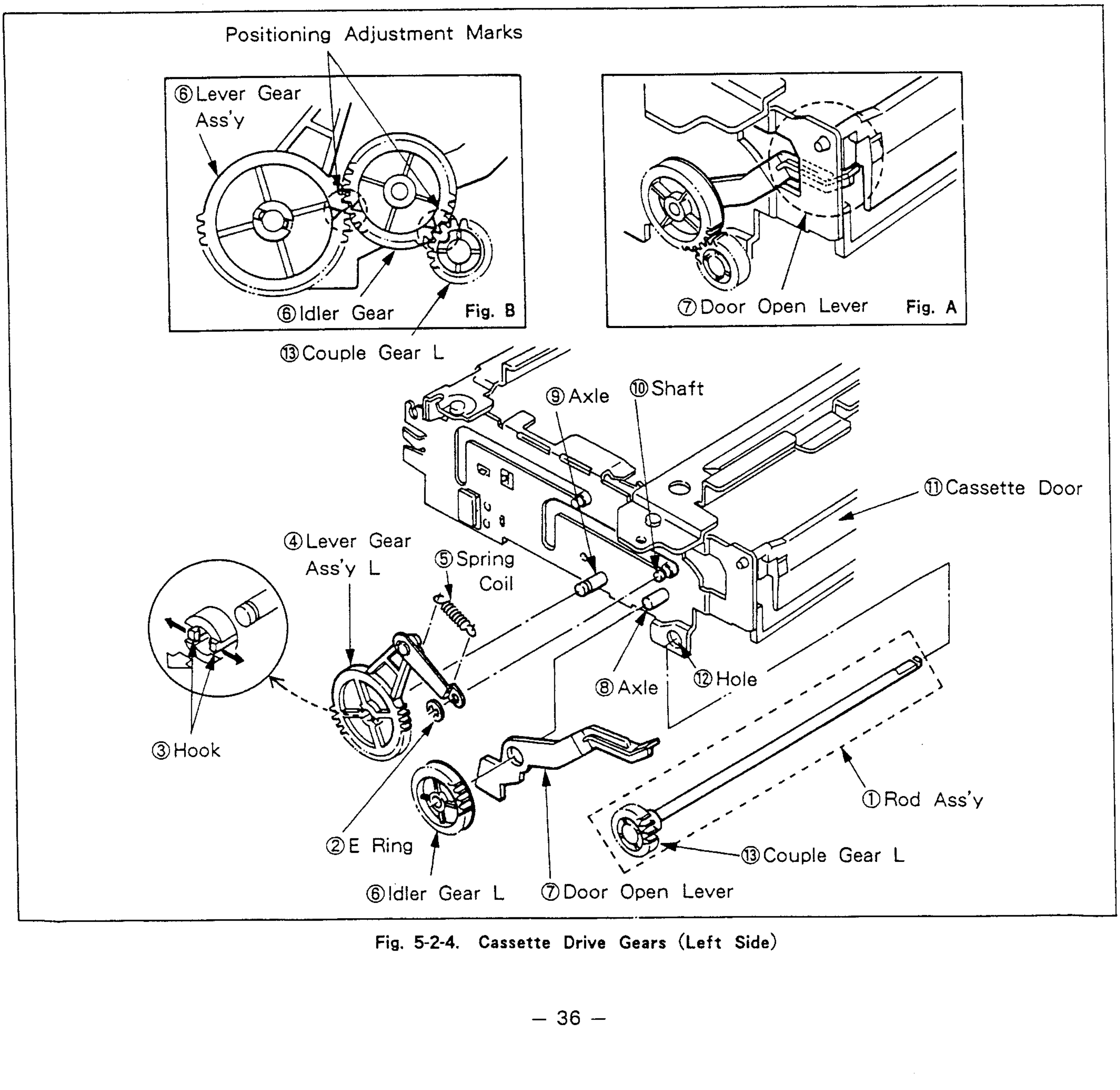

Positioning Adjustment Marks
⑥Lever Gear Ass'y
⑥Idler Gear
Fig. B
⑬Couple Gear L
⑦Door Open Lever
Fig. A
⑨Axle
⑩Shaft
⑪Cassette Door
④Lever Gear Ass'y L
⑤Spring Coil
⑧Axle
⑫Hole
③Hook
①Rod Ass'y
②E Ring
⑬Couple Gear L
⑥Idler Gear L
⑦Door Open Lever

Fig. 5-2-4. Cassette Drive Gears (Left Side)

5-2-5. FL Start Switch (See Fig. 5-2-5.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the screw ①.
3) Remove the lead wire of the FL START SWITCH ②.

2. Remounting

1) Solder the lead wire to the FL START SWITCH ② terminal.
2) Align the FL START SWITCH ② protuberance to the hole ⑤, then mount it onto the GEAR BRACKET ASS'Y ③ with the screw ①. Do it so that the FL START SWITCH ② is turned ON by holding the pin ④ of IDLER GEAR in the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

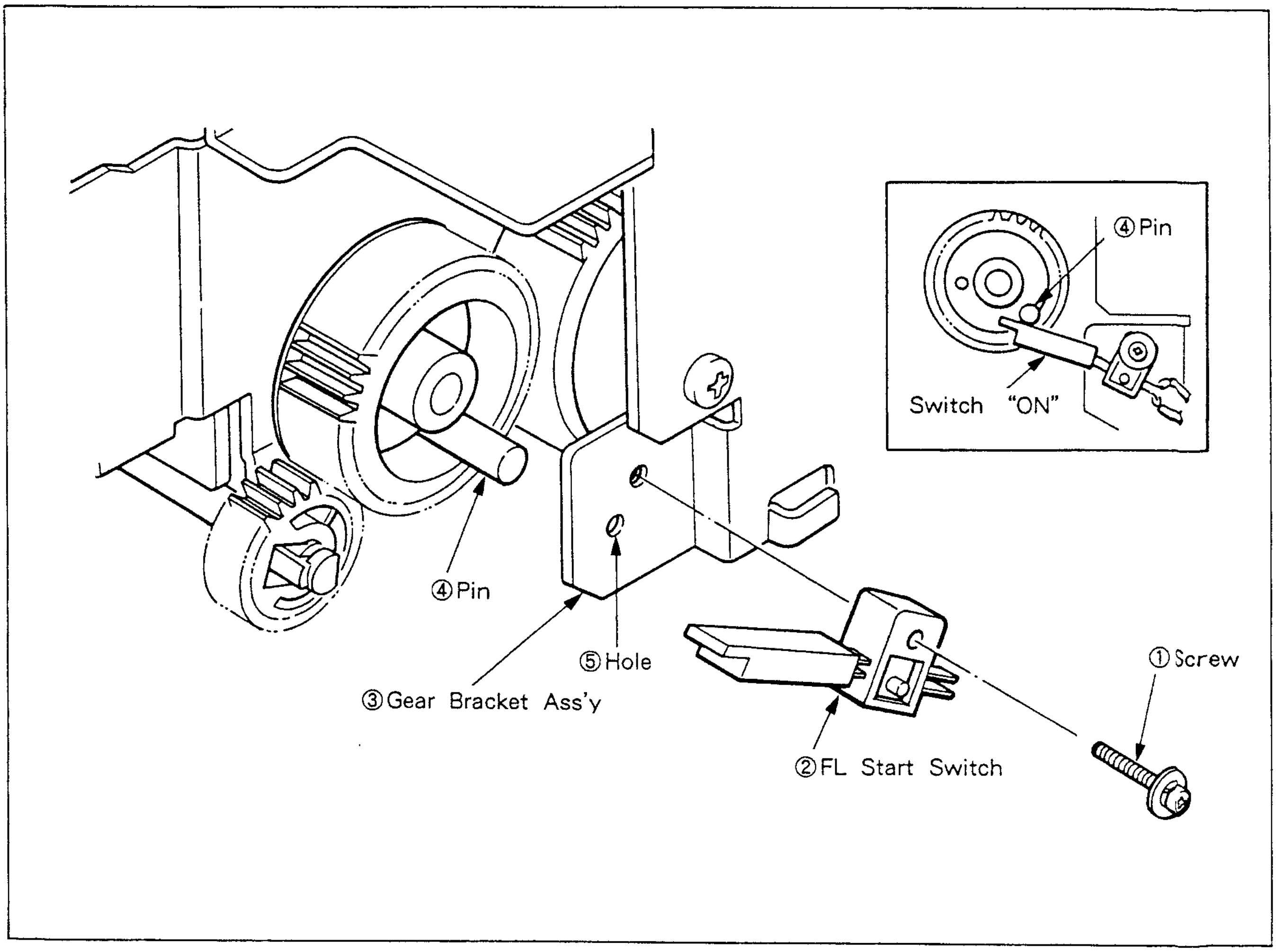

④Pin
Switch "ON"
④Pin
⑤Hole
③Gear Bracket Ass'y
①Screw
②FL Start Switch

Fig. 5-2-5. FL Start Switch

5-2-6. T-Top Sensor, T-End Sensor (See Fig. 5-2-6.)

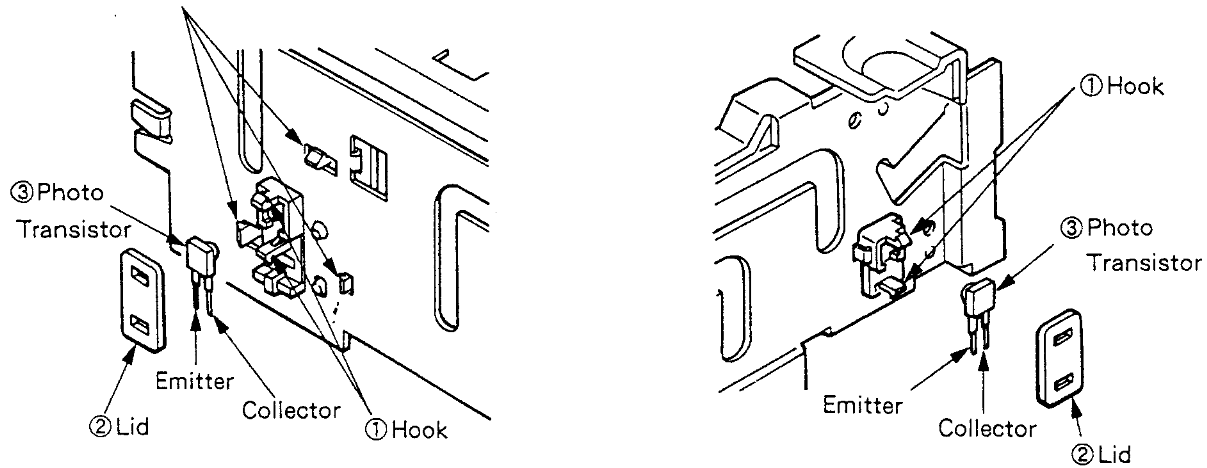
1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) When removing the T-TOP SENSOR, remove the GEAR BRACKET ASS'Y as instructed in 5-2-2.
3) Unhook the hook ① as instructed in Fig. A, then remove the LID ②. Take care not to push the hook ① too much, otherwise it may be deformed or broken.
4) Remove the phototransistors ③, then remove the lead wire.

Note : Mounting position of the transistor holder on the T-END SENSOR side is precisely adjusted at the factory, so do never remove it from the COMPL CASSETTE MECHANISM.

2. Remounting

1) Solder the brown lead wire to the emitter side, and the red lead wire to the collector side of the T-TOP SENSOR phototransistor ③.
   Solder the orange lead wire to the emitter side, and the yellow lead wire to the collector side of the T-END SENSOR phototransistor.
2) Mount the phototransistors ③ onto their respective holders.
3) Mount the LID ② and fix it with the hook ①.
4) Mount the GEAR BRACKET ASS'Y as instructed in 5-2-2.
5) Mount the COMPL CASSETTE MECHANISM as insturcted in 5-2-1.


Do not remove the holder from the compl cassette mechanism.

(T・END Sensor)

(T・TOP Sensor)

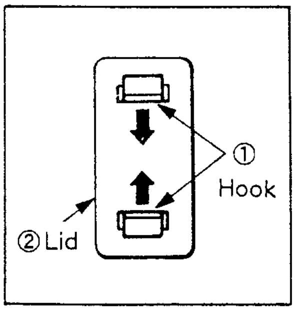


Fig. A

Fig. 5-2-6. T TOP Sensor & T END Sensor

5-3. COMPL HOLDER MOTOR (LOADING MOTOR BLOCK)

5-3-1. COMPL Motor Bracket

1. Removal

1) Remove the PRE-AMP UNIT and the PRE-AMP. BRACKET as instructed in 5-1.
2) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
3) Remove the two screws ① and the other one ⑩, then remove the COMPL HOLDER MOTOR ② (see Fig. 5-3-1.).

2. Remounting

1) Set the mechanism chassis to the INITIAL mode. In this mode, look at the mechanism chassis positioning holes ③ just from above and align the MAIN CAM ④ and MODE CAM ⑤ positioning holes as shown in Fig. A.
2) Set the COMPL HOLDER MOTOR ② to the INITIAIL mode with the mode selector (VHJ-0050). In this position, the FRONT LOADING GEAR △ mark ⑥ is aligned with the MOTOR HOLDER INITIAL mode position mark ⑦ (see Fig. B.).
3) Align the ROTARY SWITCH (mode detector switch) ⑧ with the INITIAL mode position mark ⑨ (see Fig. C.).
4) Align the COMPL HOLDER MOTOR main unit ② with the protuberance ⑪, then mount it with the two screws ① and the other one ⑩.
5) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
6) Mount the PRE-AMP UNIT and the PRE-AMP. BRACKET as instructed in 5-1.

Note : Normal mechanism operation cannot be achieved if initial positioning of the MAIN CAM ④, the MODE CAM ⑤ and the ROTARY SWITCH (mode detector switch) ⑧ are not performed precisely.

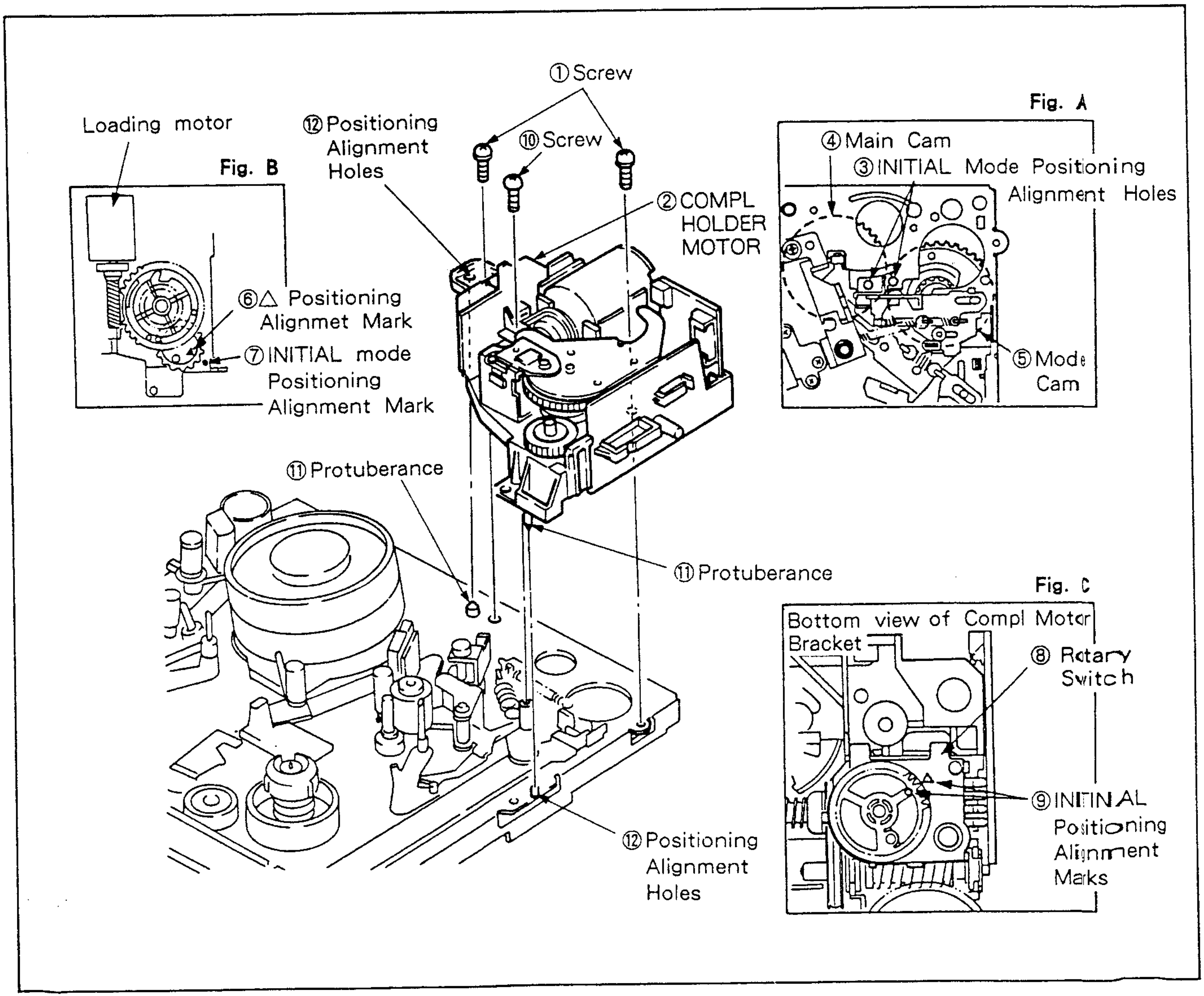

①Screw
⑩Screw
⑫Positioning Alignment Holes
Loading motor
Fig. B
⑥△ Positioning Alignmet Mark
⑦INITIAL mode Positioning Alignment Mark
②COMPL HOLDER MOTOR
Fig. A
④Main Cam
③INITIAL Mode Positioning Alignment Holes
⑤Mode Cam
⑪Protuberance
⑪Protuberance
Fig. C
Bottom view of Compl Motor Bracket
⑧ Rotary Switch
⑨INITINAL Positioning Alignment Marks
⑫Positioning Alignment Holes

Fig. 5-3-1 Compl Holder Motor

5-3-2. Loading Motor (Refer to Fig. 5-3-2.)

1. Removal

LOADING MOTOR can be replaced after LOADING MOTOR BLOCK unit has been removed by referring to 5-3-1. The 1990 version of the mechanism allows LOADING MOTOR itself to be replaced without removing CASSETTE HOLDER BLOCK and LOADING MOTOR BLOCK. The following describes this procedure.

1) Use MODE SELECTOR (VHJ-0050) to set the mechanism to the initial mode.
2) Remove the connector for DEW SENSOR connected to the MC-3 board ①.
3) Remove three screws ② and remove HOLDER BRACKET ④ with FRONT WORM ASS'Y ③ still attached.
4) Remove DAMPER ⑥ attached to the pulley of LOADING MOTOR ⑤.
5) Remove FRONT HELICAL GEAR ⑦ and WASHER ⑧.
6) Remove soldered LEAD WIRE from the terminal of LOADING MOTOR ⑤.
7) Remove LOADING BELT ⑨.
8) Remove LOADING MOTOR ⑤ by lifting up from the back terminal side.

2. Remounting

Before attaching LOADING MOTOR ⑤ to MOTOR BRACKET ASS'Y ⑩, confirm DAMPER ⑪ and DAMPER ⑫ shown in Fig. 5-3-5. are in the proper position on MOTOR BRACKET ASS'Y ⑩.

1) LOADING MOTOR ⑤ puts REAR SIDE BOSS ㉓ in the slit ㉔ of MOTOR HOLDER ⑩.
   Further, mount the tap hole ⑬ at two points of the front pulley side so that the it is secured to the PROTUBERANCE ⑭ of the MOTOR HOLDER at two points.
2) Solder the lead wire from the MC-3 board to LOADING MOTOR ⑤ terminal. (Solder the red lead wire to the positive terminal side.)
3) Hang LOADING BELT ⑨ on the pulley.
4) After hanging BELT ⑨ on the pulley, confirm that the mechanism unit is in the initial mode. The initial mode is indicated by Fig. A of Fig. 5-3-2., and is the position in which INITIAL POSITIONING ALIGNMENT HOLEs of MAIN CAM ⑮ and MODE CAM ⑯ are lined up with THROUGH HOLE ⑰ of MOTOR HOLDER. If the initial mode is not selected, adjust with MODE SELECTOR (VHJ-0050).
5) As shown in Fig. B, confirm the positions of the △ POSITIONING ALIGNMENT MARK on FRONT LOAD GEAR ⑱ and INITIAL MARK ⑲ position of MOTOR HOLDER and the position relationship of CASSETTE HOLDER RACK ⑳.
6) Apply a light coat of grease to the entire sides of AXLE ㉑ and FRONT HELICAL GEAR ⑦.
7) Attach FRONT HELICAL GEAR ⑦ and WASHER ⑧ to AXLE ㉑. As shown in Fig. C, FRONT HELICAL GEAR ⑦ is attached so that the indent on the side is inside PIN ㉒ of FRONT LEVER ASS'Y.
8) Attach DAMPER ⑥ to LOADING MOTOR ⑤ pulley.
9) HOLDER BRACKET ④ is attached by engaging FRONT WORM ASS'Y ③ with LOADING MOTOR ⑤ pulley, and held in place with three screws ②.
10) Attach the connector of DEW SENSOR ㉕ to the MC-3 board ① and return the mechanism to the eject completion using MODE SELECTOR.

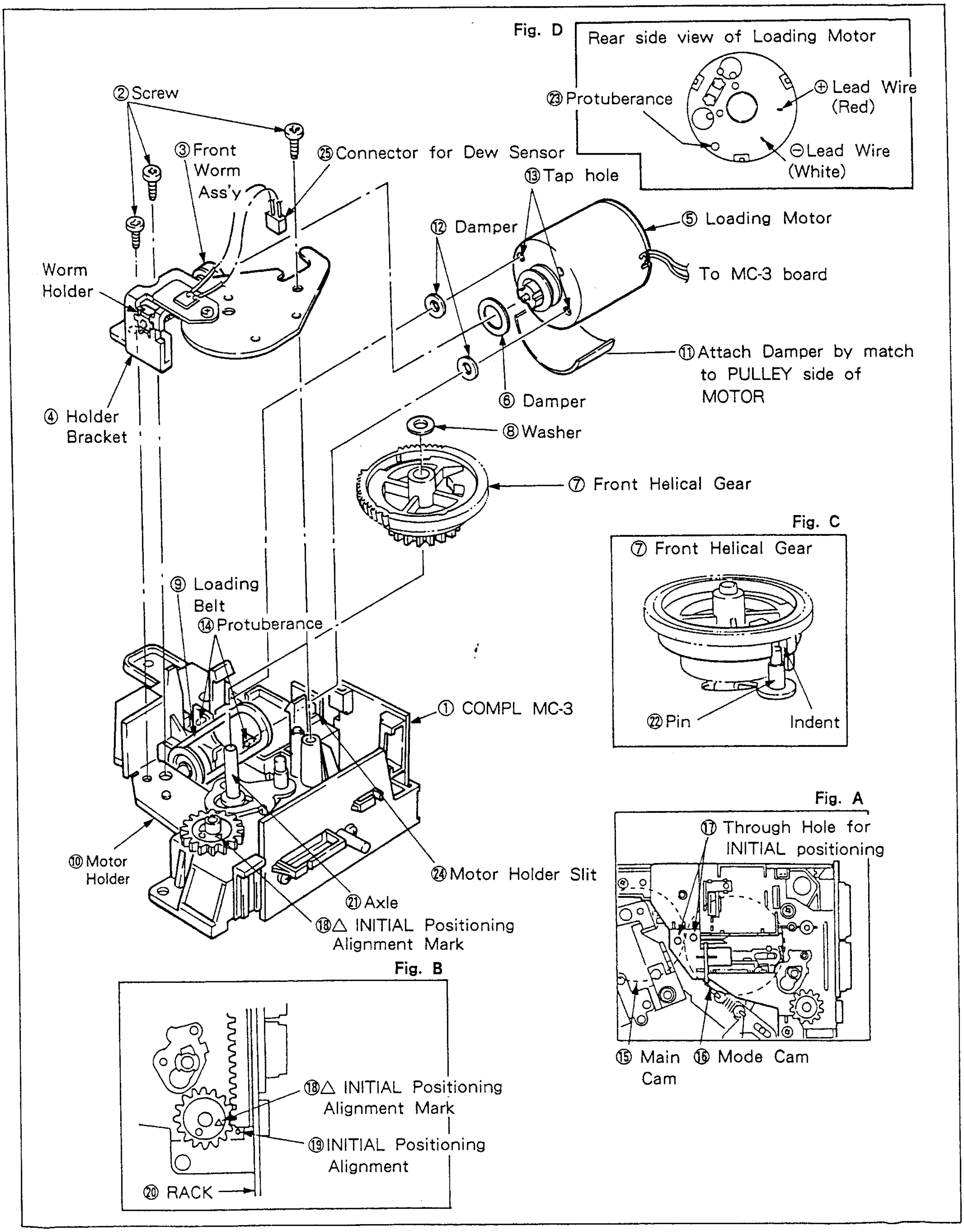


Fig. D
Rear side view of Loading Motor
㉓ Protuberance
⊕ Lead Wire (Red)
⊖ Lead Wire (White)
② Screw
③ Front Worm Ass'y
㉕ Connector for Dew Sensor
⑬ Tap hole
⑫ Damper
⑤ Loading Motor
To MC-3 board
Worm Holder
⑪ Attach Damper by match to PULLEY side of MOTOR
④ Holder Bracket
⑥ Damper
⑧ Washer
⑦ Front Helical Gear
Fig. C
⑦ Front Helical Gear
㉒ Pin
Indent
⑨ Loading Belt
⑭ Protuberance
① COMPL MC-3
Fig. A
⑰ Through Hole for INITIAL positioning
⑩ Motor Holder
㉔ Motor Holder Slit
㉑ Axle
⑱△ INITIAL Positioning Alignment Mark
⑮ Main Cam
⑯ Mode Cam
Fig. B
⑱△ INITIAL Positioning Alignment Mark
⑲ INITIAL Positioning Alignment
⑳ RACK

Fig. 5-3-2. Loading Motor

5-4. TAPE LOADING MECHANISM

5-4-1. Main Parts of the Tape Loading Mechanism (See Fig. 5-4-1.)

1. Removal

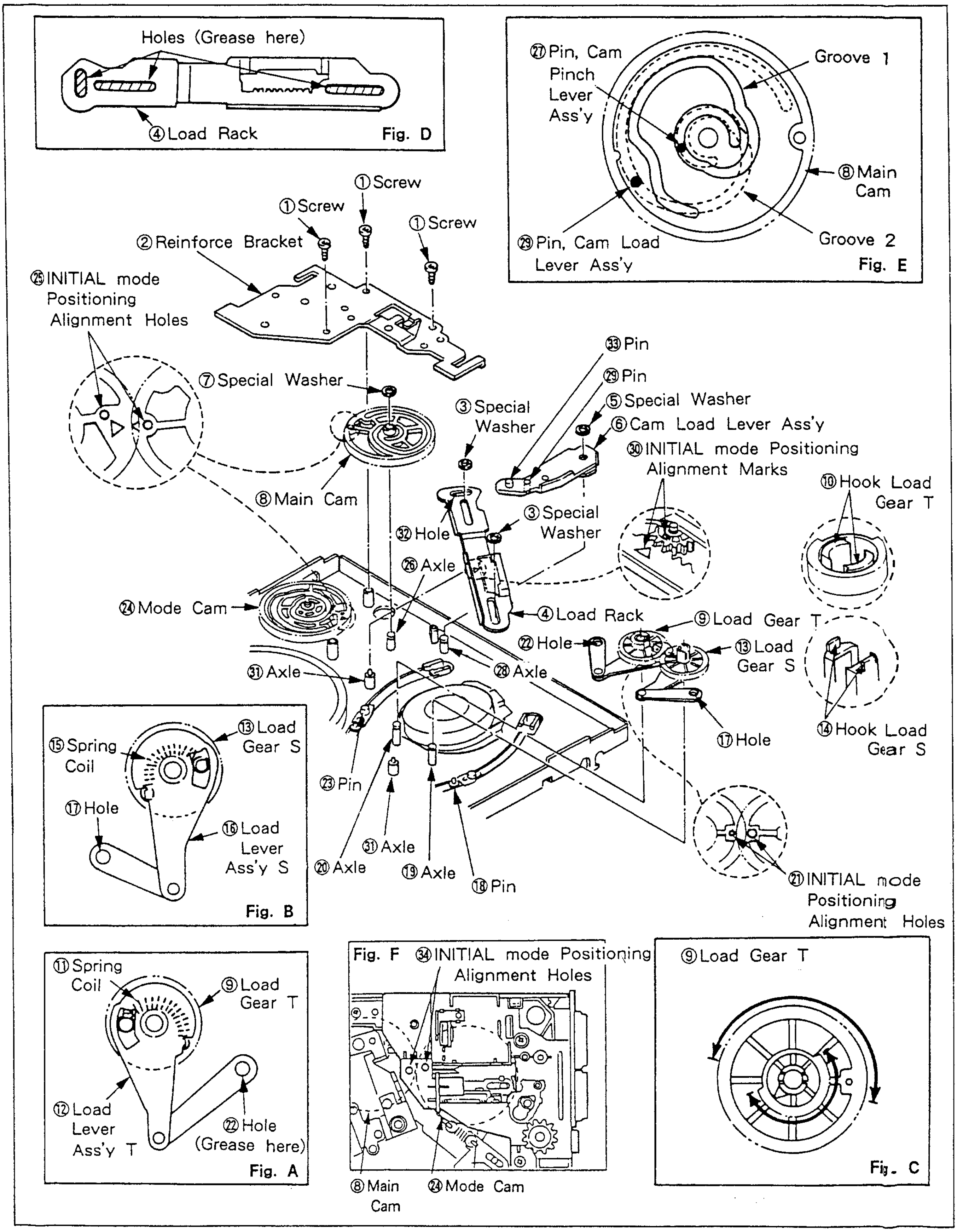
1) Remove connectors from the DRUM MOTOR board (SV-5).
2) Remove the three screws ①, then remove the REINFORCE BRACKET ②.
3) Remove the two special washers ③, then remove the LOAD RACK ④.
4) Remove the special washer ⑤, then remove the CAM LOAD LEVER ASS'Y ⑥.
5) Remove the stop washer ⑦, then remove the MAIN CAM ⑧.
6) Unhook the LOAD GEAR T hook ⑩, then remove the LOAD GEAR T ⑨ as shown in Fig. A, with the SPRING COIL ⑪ and the LOAD LEVER ASS'Y T ⑫ attached to it.
7) Unhook the LOAD GEAR S hook ⑭, then remove the LOAD GEAR S ⑬ as shown in Fig. B, with the SPRING COIL S ⑮ and the LOAD LEVER ASS'Y S ⑯ attached to it.

Note : Take care not to open the LOAD GEAR hooks too much, otherwise they may be deformed or broken. If they are, replace them.

2. Remounting

1) Apply grease to the inner surface of the LOAD LEVER ASS'Y S ⑯ hole ⑰, as shown in Fig. B.
2) Apply grease to the inner surface of the LOAD LEVER ASS'Y T ⑫ hole ㉒ and to the section of the LOAD GEAR T ⑨ indicated with an arrow in Fig. C.
3) Apply grease to GROOVEs 1 and 2 of the MAIN CAM ⑧, and to the outer side of the teeth.
4) Apply grease to the three oval holes of the LOAD RACK ④ as shown in Fig. D.
5) Apply grease to the outer surface of axles ⑲ ⑳㉖ and ㉘.
6) After assembling as shown in Fig. B, mount the LOAD GEAR S ⑬ onto the axle ⑲. Insert the ROLLER BASE S pin ⑱ into the LOAD LEVER ASS'Y S hole ⑰.
7) After assembling as shown in Fig. A, mount the LOAD GEAR T ⑨ onto the axle ⑳. When doing so, set the LOAD GEAR S ⑬ and the LOAD GEAR T ⑨ to the INITIAL mode position ㉑. Insert the ROLLER BASE T pin ㉓ into the hole ㉒ of the LOAD LEVER ASS'Y T ⑫.
8) Mount the MAIN CAM ⑧ on the axle ㉖. At that time, make sure that the positioning hole ㉕ of the MAIN CAM ⑧ and the MODE CAM ㉔ matches the initial positioning hole ㉞ of the MECHANISM CHASSIS. Also check to be sure that the Pin ㉗ of the CAM PINCH LEVER ASSEMBLY is put in the groove ① of the MAIN CAM as shown in Fig. E.
9) Mount the special washer ⑦ to the axle ㉖.
10) Mount the CAM LOAD LEVER ASS'Y ⑥ onto the axle ㉘. Insert the pin ㉙ into the MAIN CAM GROOVE 2 as shown in Fig. E.
11) Mount the special washer ⑤ onto the axle ㉘.
12) Set the LOAD RACK ④ to the INITIAL mode position ㉚ with the LOAD GEAR T ⑨, and mount onto the two axles ㉛. Insert the CAM LOAD LEVER ASS'Y pin ㉝ into the hole ㉜.
13) Mount the two special washers ③ onto the two axles ㉛.
14) Mount the REINFORCE BRACKET ② with the three screws ①.
15) Insert the connector into the DRUM MOTOR board (SV-5).
16) Confirm that loading and unloading are performed smoothly.

Note : Be sure to perform INITIAL mode positioning of cams and gears precisely.


Holes (Grease here)
④Load Rack
Fig. D
㉗Pin, Cam Pinch Lever Ass'y
Groove 1
⑧Main Cam
Groove 2
㉙Pin, Cam Load Lever Ass'y
Fig. E
①Screw
①Screw
①Screw
②Reinforce Bracket
㉕INITIAL mode Positioning Alignment Holes
⑦Special Washer
⑧Main Cam
㉝Pin
㉙Pin
⑤Special Washer
⑥Cam Load Lever Ass'y
㉚INITIAL mode Positioning Alignment Marks
③Special Washer
⑩Hook Load Gear T
㉜Hole
③Special Washer
㉖Axle
㉔Mode Cam
④Load Rack
⑨Load Gear T
㉒Hole
⑬Load Gear S
㉛Axle
㉘Axle
⑰Hole
⑭Hook Load Gear S
⑮Spring Coil
⑬Load Gear S
⑰Hole
⑯Load Lever Ass'y S
Fig. B
㉓Pin
㉛Axle
⑳Axle
⑲Axle
⑱Pin
㉑INITIAL mode Positioning Alignment Holes
⑪Spring Coil
⑨Load Gear T
⑫Load Lever Ass'y T
㉒Hole (Grease here)
Fig. A
Fig. F
㉞INITIAL mode Positioning Alignment Holes
⑧Main Cam
㉔Mode Cam
⑨Load Gear T
Fig. C

5-4-1. Loading Mechanism Main Parts

5-4-2. Mode Cam (See Fig. 5-4-2.)

1. Removal

1) Set the INITIAL mode with the mode selector (VHJ-0050).
2) Remove the REINFORCE BRACKET as instructed in 5-4-1.
3) Remove the two stop washers ①, then remove the CAM PLATE SLIDE ASS'Y ②.
4) Remove the MODE CAM ③.

2. Remounting

1) Referring to 5-4-1., confirm that the MAIN CAM is in the INITIAL mode position.
2) In case the MAIN CAM is misplaced, use the mode selector (VHJ-0050) to align the MAIN CAM positioning hole with the chassis INITIAL mode position hole (refer to 5-4-1. for the INITIAL mode position). Since the ROTARY SWITCH (mode detector switch) does not rotate, the mode selector indicator lamp will not show the correct mode.
3) Align the ROTARY SWITCH (mode detector switch) ④ with the INITIAL mode position mark ⑤ as shown in Fig. A.
4) Mount the MODE CAM ③ onto the axle ⑥. Do it so that the SLIDE CAM ASS'Y pin ⑪ is placed in the GROOVE 3 as shown in Fig. B.
5) Mount the CAM PLATE SLIDE ASS'Y ② onto the axles ⑥ and ⑦. Do it so that the pin ⑧ gets into the GROOVE 4 of the MODE CAM as shown in Fig. B, and the point ⑨ of the bent-up part into the ACT PLATE SLIDE ASS'Y hole ⑩.
6) Mount the two special washers ① onto the axles ⑥ and ⑦.
7) Mount the REINFORCE BRACKET as instructed in 5-4-1.

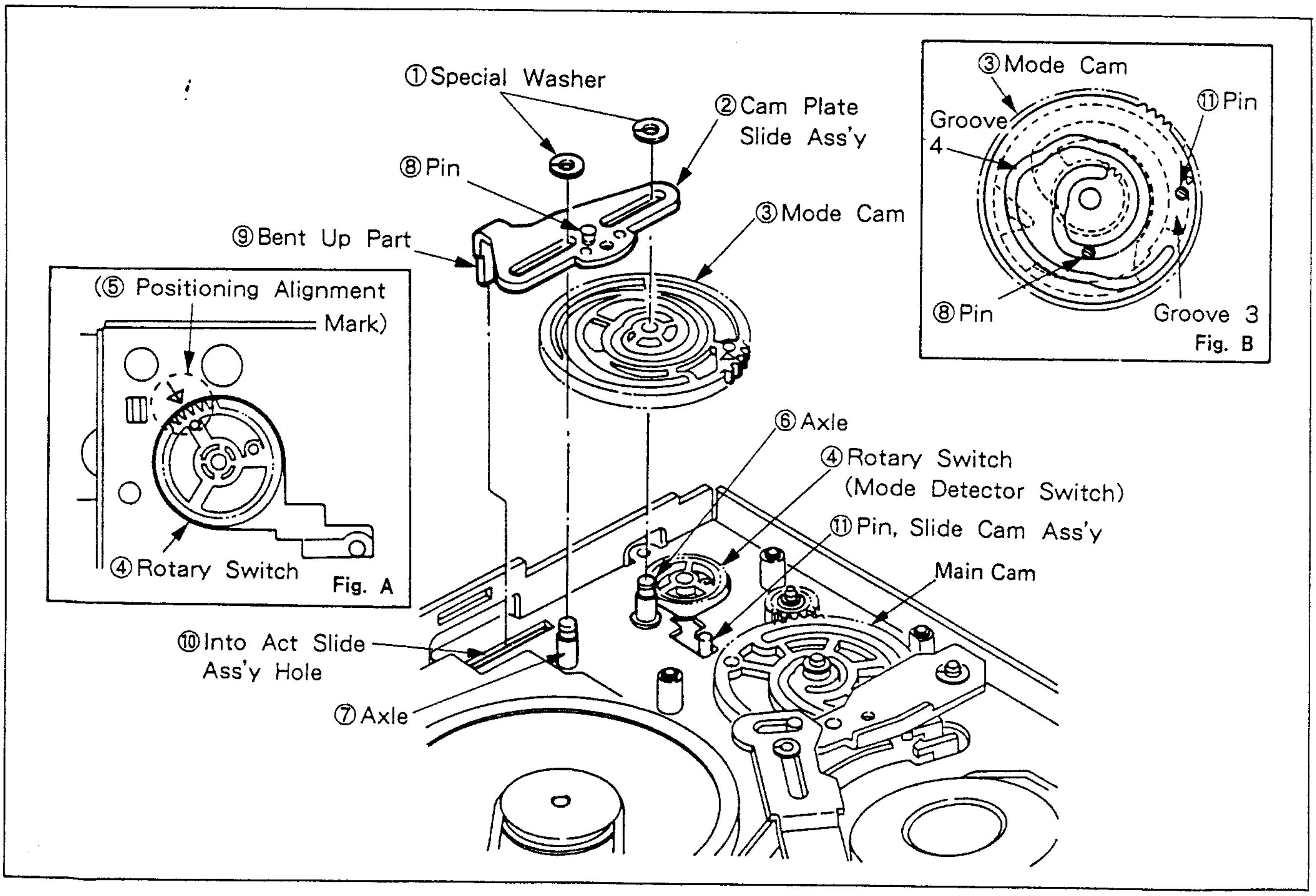

①Special Washer
②Cam Plate Slide Ass'y
⑧Pin
⑨Bent Up Part
③Mode Cam
(⑤ Positioning Alignment Mark)
④Rotary Switch
Fig. A
③Mode Cam
Groove 4
⑪Pin
⑧Pin
Groove 3
Fig. B
⑥Axle
④Rotary Switch (Mode Detector Switch)
⑪Pin, Slide Cam Ass'y
Main Cam
⑩Into Act Slide Ass'y Hole
⑦Axle

Fig. 5-4-2. Mode Cam

5-5. COMPL HEAD BRACKET (ACE HEAD) (See Fig. 5-5-1.)

1. Removal

1) Remove the COMPL HEAD BRACKET special mounting nut ②.
2) Remove the SLEEVE ③, the COMPL HEAD BRACKET ① and the ACE HEAD SPRING COIL ④, in that order.

Note: Take care not to scratch or soil the ACE head surface.

2. Remounting

1) Apply grease to the axle ⑥ as shown in Fig. A.
2) Apply grease to the spot where the COMPL HEAD BRACKET ① makes contact with the STOPPER ⑦ (See Fig. A).
3) Mount the ACE HEAD SPRING COIL ④ and the COMPL HEAD BRACKET ①, in that order, onto the axle ⑥. Hook one end of the ACE HEAD SPRING COIL ④ to the notch ⑤, and the other end to the COMPL HEAD BRACKET, so that the COMPL HEAD BRACKET is pressed against the STOPPER ⑦ (See Fig. A).
4) Mount the SPECIAL NUT ② onto the axle ⑥ through the SLEEVE ③.
5) Clean the ACE head surface with a chamois leather moistened with methyl alcohol.
6) Perform ACE head adjustment as instructed in 6-4.

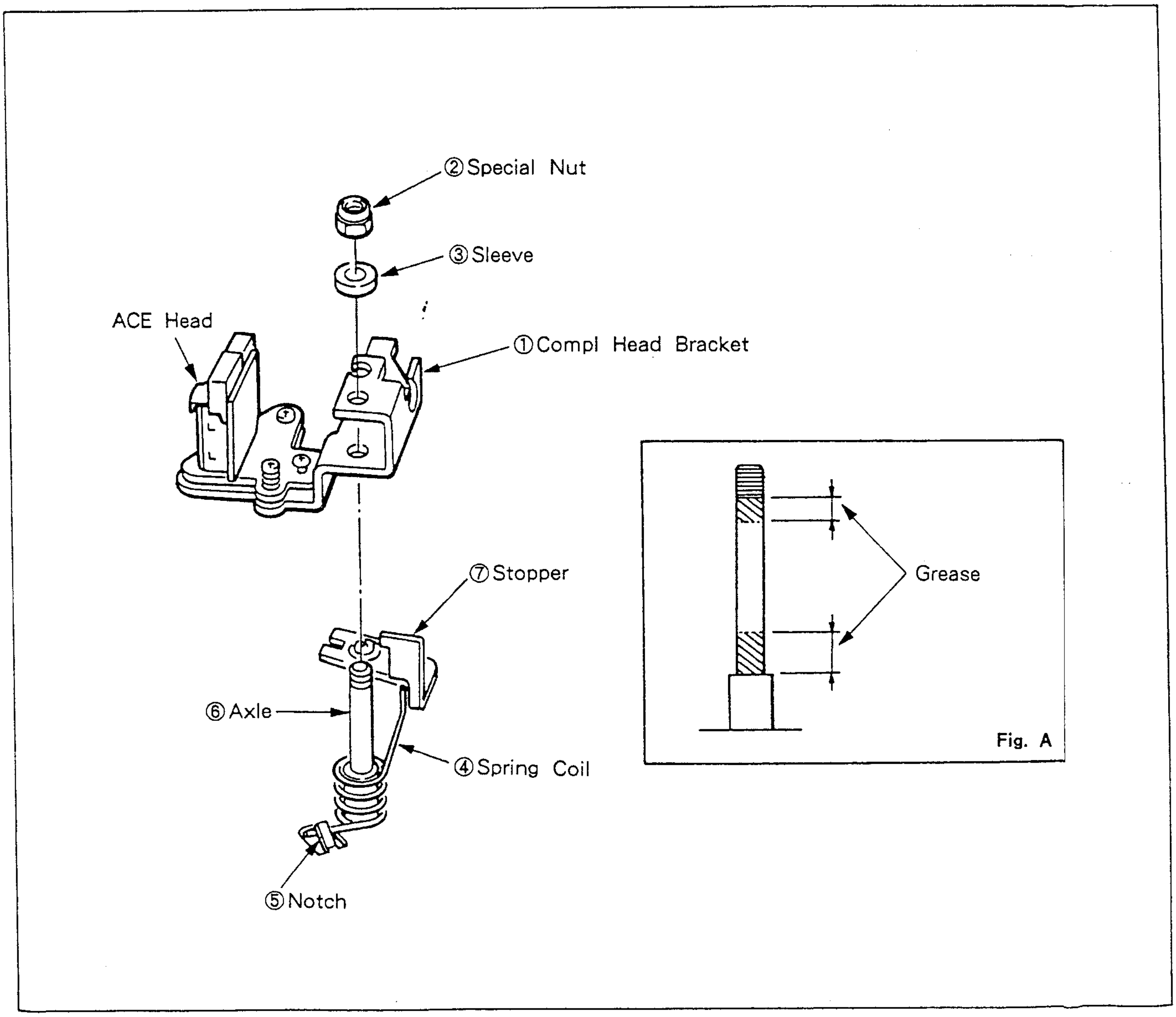

②Special Nut
③Sleeve
ACE Head
①Compl Head Bracket
⑦Stopper
⑥Axle
④Spring Coil
⑤Notch
Grease
Fig. A

Fig. 5-5-1. Compl Head Bracket (ACE Head)

5-6. PINCH ROLLER PRESSURE MECHANISM (See Fig. 5-6-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COMPL HEAD BRACKET as instructed in 5-5.
3) Remove the PINCH SPRING COIL ①.
4) Remove the special washer ②, then remove the PINCH LEVER ASS'Y ③.
5) Remove the REV GUIDE LEVER SPRING COIL ④.
6) Remove the REV GUIDE LEVER ASS'Y ⑥ from the hook ⑤ of the plastic molding bearing on the bottom side. Use a jig VHJ-0073 shown in Fig. 5-6-2 to widen the hook ⑤ of the plastic molding bearing. By so doing, the above removal of the REV GUIDE LEVER ASS'Y ⑥ can be made more easily. Care should be taken to avoid pushing the jig VHJ-0073 too much. Pushing it too hard may damage the hook in an extreme case.
7) Remove the LINK LOCK SPRING COIL ⑦.
8) Remove the special washer ⑧, then remove the PINCH CAM LEVER ASS'Y ⑨.
9) Remove the ACT PINCH SLIDE ASS'Y ⑩.

Note : If damaged the claw ⑤ of the plastic bearing, reference should be made to Section 3. "Method of Repairing the Bearing Section of REV GUIDE LEVER ASSEMBLY".

2. Remounting

1) Apply grease to pins ⑫/⑬ and axles ⑯/⑱.
2) Apply grease to the ACT PINCH SLIDE ASS'Y pin ⑰.
3) Set the INITIAL mode with the mode selector (VHJ-0050).
4) Mount the ACT PINCH SLIDE ASS'Y ⑩ onto pins ⑫ and ⑬.
5) Insert the pin ⑭ of the PINCH CAM LEVER ASS'Y ⑨ into the MAIN CAM ⑪ GROOVE 1, and mount onto the axle ⑯ while inserting the pin ⑰ of the ACT PINCH SLIDE ASS'Y into the hole ⑮.
6) Mount the special washer ⑧ onto the axle ⑯.
7) Hook the LINK LOCK SPRING COIL ⑦ to the PINCH CAM LEVER ASS'Y ⑨.
8) Mount the REV GUIDE LEVER ASS'Y ⑥ to the plastic molding bearing, then fix it with the hook ⑤ at the bottom.
9) Hook the REV GUIDE LEVER SPRING COIL ④.
10) Mount the PINCH LEVER ASS'Y ③ to the axle ⑱.
11) Mount the special washer ② to the axle ⑱.
12) Hook the PINCH SPRING COIL ① between the ACT PINCH SLIDE ASS'Y ⑩ and the PINCH LEVER ASS'Y ③.
13) Mount the COMPL HEAD BRACKET as instructed in 5-5.
14) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
15) Perform ACE head adjustment as instructed in 6-4.

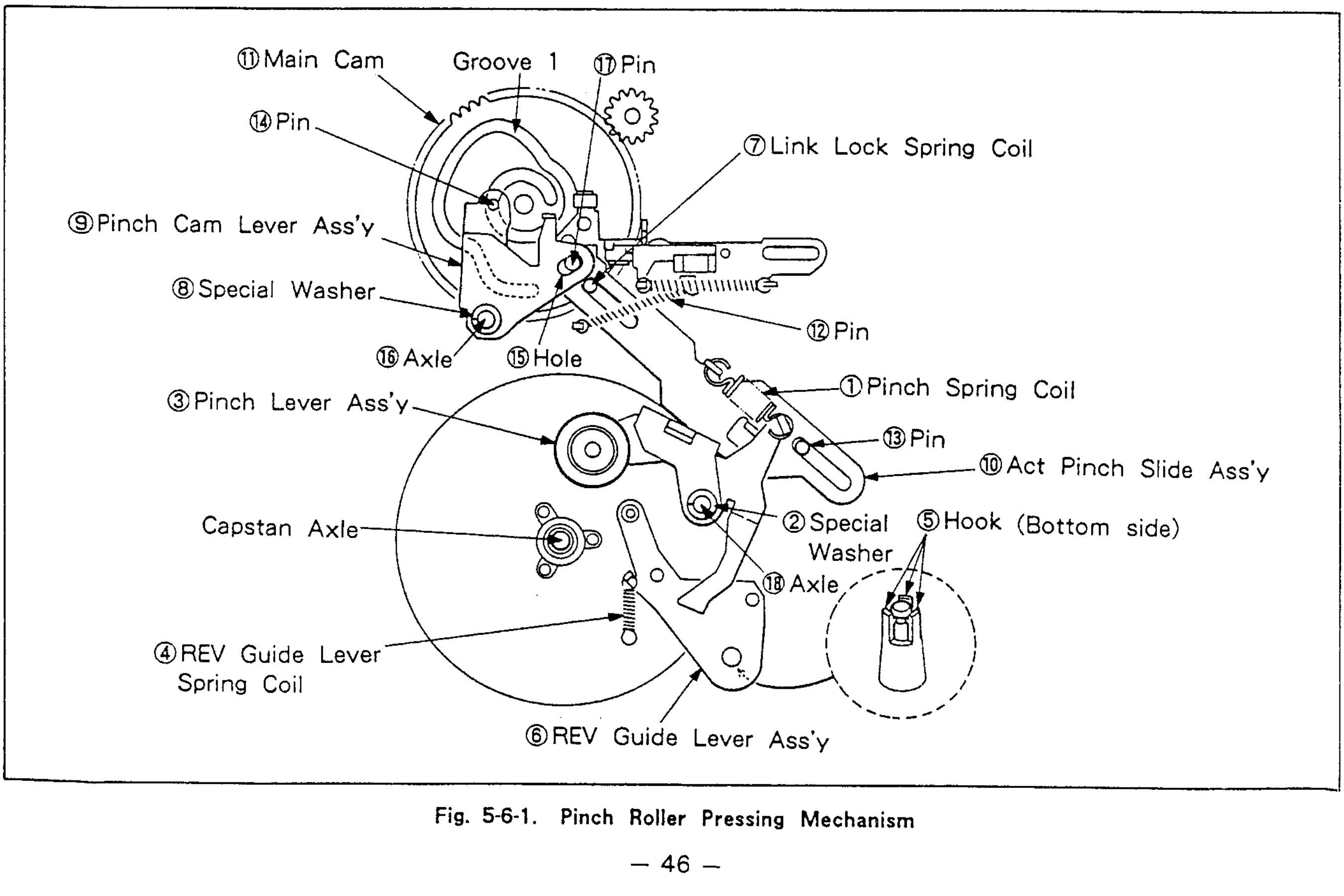
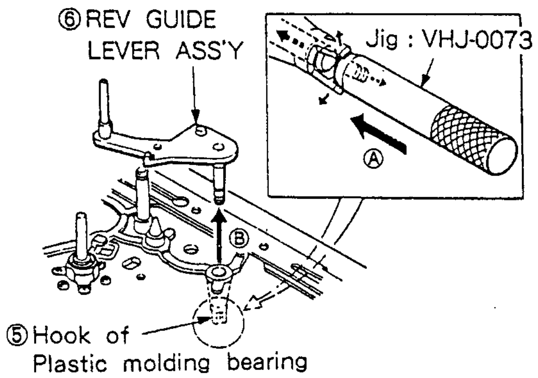

⑪Main Cam
Groove 1
⑰Pin
⑭Pin
⑦Link Lock Spring Coil
⑨Pinch Cam Lever Ass'y
⑧Special Washer
⑫Pin
⑯Axle
⑮Hole
③Pinch Lever Ass'y
①Pinch Spring Coil
⑬Pin
⑩Act Pinch Slide Ass'y
Capstan Axle
②Special Washer
⑤Hook (Bottom side)
⑱Axle
④REV Guide Lever Spring Coil
⑥REV Guide Lever Ass'y

Fig. 5-6-1. Pinch Roller Pressing Mechanism


⑥REV GUIDE LEVER ASS'Y
Jig : VHJ-0073
Ⓐ
Ⓑ
⑤Hook of Plastic molding bearing

Remove REV GUIDE LEVER ASS'Y in the direction of arrow Ⓑ, pushing VHJ-0073 slightly in the direction of arrow Ⓐ.
Be careful not to damage the hook by pushing too much.

Fig. 5-6-2 Method of Using the Jig VHJ-0073

3. Method of Repairing the Bearing Section of REV GUIDE LEVER ASSEMBLY

If the hook of the plastic molding bearing is damaged in the process of removing the REV GUIDE LEVER ASS'Y, proceed with the repair as follows :

1) Scrape the broken hook of the bearing section with a cutter knife and flatten it.
2) Insert the REV GUIDE LEVER ASS'Y in the bearing and fit a stopper washer in. The special washer to be used must be Part No. 411 109 1605. This stop washer (Part No. 411 109 1605) is the same as that used on SUPPLY REEL ASS'Y or TAKE-UP REEL ASS'Y.
   Remove the REV GUIDE LEVER ASSEMBLY toward an arrow B while pushing the jig VHJ-0073 lightly in the direction of an arrow.

Pushing the jig VHJ-0073 too much may cause hook breakage. Therefore, care should be taken.

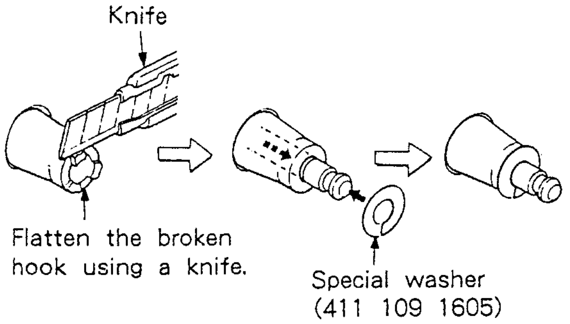

Knife
Flatten the broken hook using a knife.
Special washer (411 109 1605)

Fig. 5-6-3 Method of Repalring the Bearlnig Sectlon of the REV GUIDE LEVER ASSEMBLYE

5-7. BRAKE MECHANISM

5-7-1. Sub Take-up Brake Ass'y (See Fig. 5-7-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SPRING COIL ①.
3) While pushing the hook ② in the direction of arrow, remove the SUB TAKE-UP BRAKE ASS'Y ③.

2. Remounting

1) Mount the SUB TAKE-UP BRAKE ASS'Y ③ onto the pin ④. Confirm that the hook ② is firmly hooked to the chassis.
2) Fit the SPRING COIL between hooks ⑤ and ⑥.
3) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

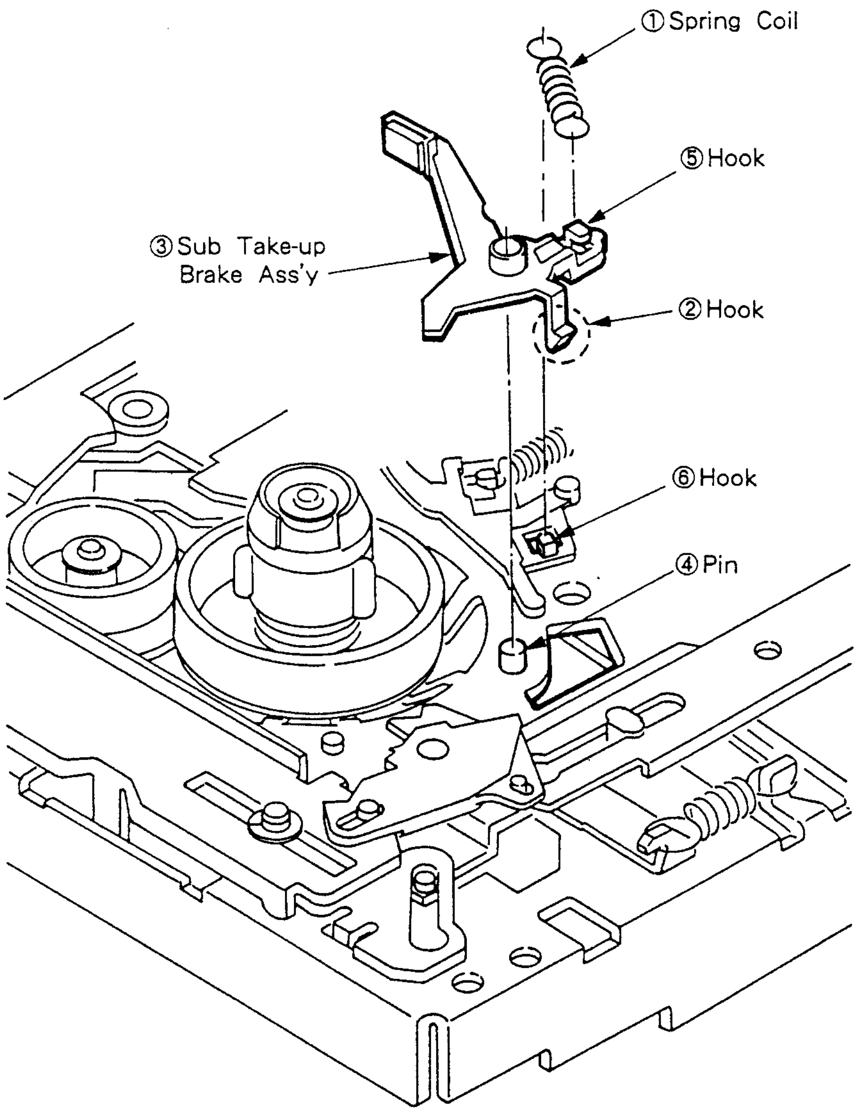

①Spring Coil
⑤Hook
③Sub Take-up Brake Ass'y
②Hook
⑥Hook
④Pin

Fig. 5-7-1. Sub Take-up Brake Ass'y

5-7-2. Supply Brake Ass'y and Take-up Brake Ass'y (See Fig. 5-7-2.)

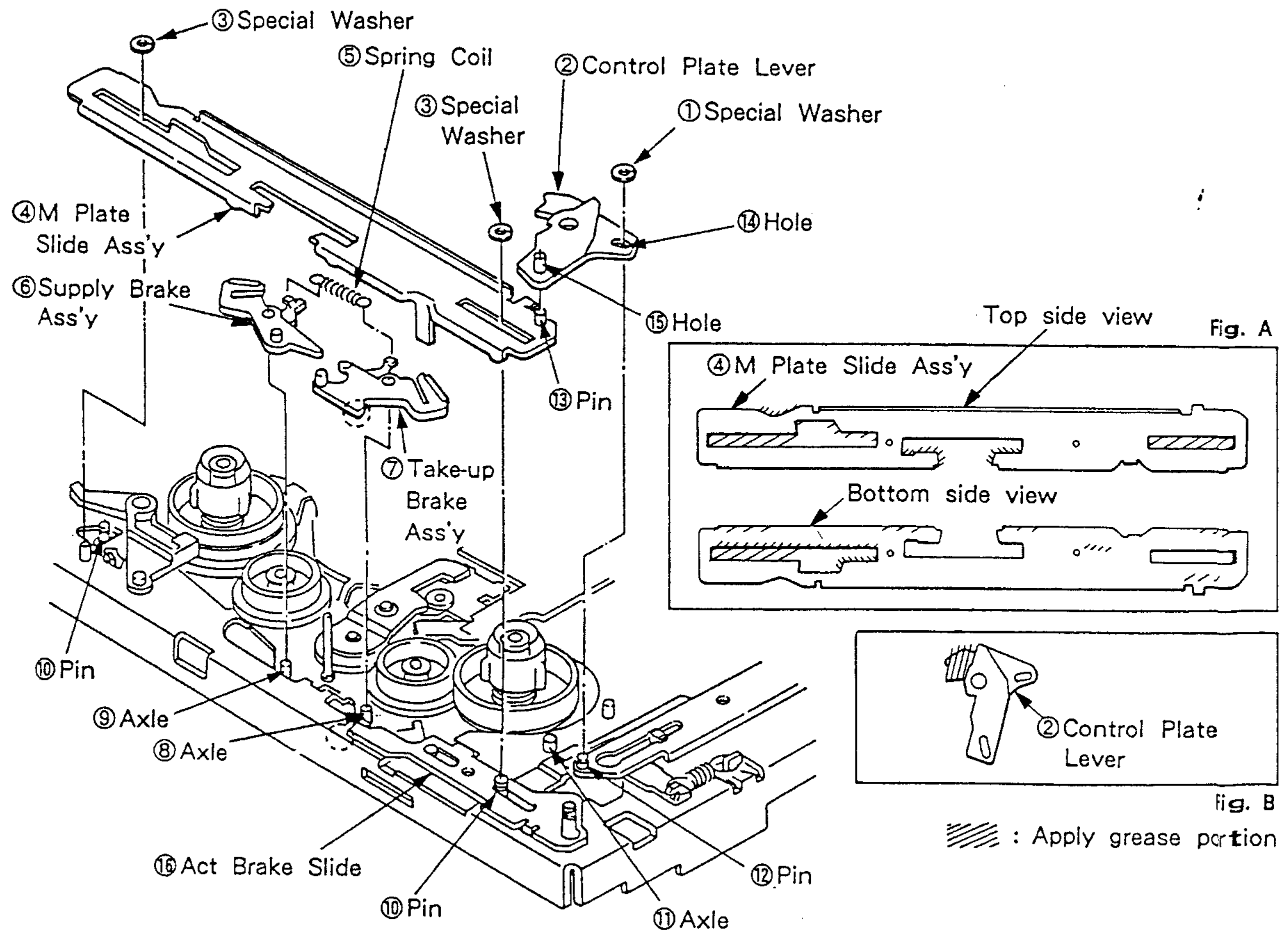
1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SUB TAKE-UP BRAKE as instructed in 5-7-1.
3) Remove the special washer ①, then remove the CONTROL PLATE LEVER ②.
4) Remove the two special washers ③, then remove the M PLATE SLIDE ASS'Y ④.
5) Remove the SPRING COIL ⑤.
6) Remove the SUPPLY BRAKE ASS'Y ⑥ and the TAKE-UP BRAKE ASS'Y ⑦.

Note: Take care not to soil the brake shoes.

2. Remounting

1) Apply a thin layer of grease to axles ⑧ and ⑨.
2) Mount the TAKE-UP BRAKE ASS'Y ⑦ onto the axle ⑧.
3) Mount the SUPPLY BRAKE ASS'Y ⑥ onto the axle ⑨.
4) After applying a thin layer of grease to the M PLATE SLIDE ASS'Y ④ as shown in Fig. A, mount it onto the two pins ⑩.
5) Mount the two special washers ③ onto the two pins ⑩.
6) After applying grease to the CONTROL PLATE LEVER ② as shown in Fig. B, mount it onto the axle ⑪. Insert the ACT PLATE SLIDE ASS'Y pin ⑫ into the hole ⑭, and the M PLATE SLIDE ASS'Y pin ⑬ into the hole ⑮.
7) Mount the special washer ① onto the pin ⑫.
8) Mount the SUB TAKE-UP BRAKE as instructed in 5-7-1.
9) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.


③Special Washer
⑤Spring Coil
②Control Plate Lever
③Special Washer
①Special Washer
④M Plate Slide Ass'y
⑭Hole
⑥Supply Brake Ass'y
⑮Hole
⑬Pin
⑦Take-up Brake Ass'y
⑩Pin
⑨Axle
⑧Axle
⑯Act Brake Slide
⑩Pin
⑪Axle
⑫Pin
Top side view
Fig. A
④M Plate Slide Ass'y
Bottom side view
②Control Plate Lever
fig. B
▨ : Apply grease portion

When assembling, the contact surfaces of Take-up Brake ⑦ and the Brake Slide ⑯ marked with ◌ should contact but not overlap each other.

Fig. 5-7-2. Supply Brake Ass'y & Take-up Brake Ass'y

5-7-3. Tension Lever Ass'y and Band Holder Ass'y (See Fig. 5-7-3.)

1. **Removal**

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the SPRING COIL ①.
3) Remove the screw ③ fixing the BAND HOLDER ASS'Y ②.
4) Push the SUB SUPPLY BRAKE ④ in the direction of the arrow A, setting the BAND HOLDER ASS'Y ② free.
5) Open the hook ⑤ a little and remove the TENSION LEVER ASS'Y ⑥. Take care not to open the hook ⑤ too much, otherwise it may be deformed or broken.
6) Remove the hook ⑦ of the BAND HOLDER ASS'Y.

2. **Remounting**

1) Mount the BAND HOLDER ASS'Y hook ⑦ into the TENSION LEVER ASS'Y hole ⑧.
2) Insert the TENSION LEVER ASS'Y axle ⑨ into the hole ⑩ and confirm that the hook ⑤ is hooked.
3) While pushing the SUB SUPPLY BRAKE ④ in the direction of arrow A, mount the BAND HOLDER ASS'Y ② with the screw ③.
4) Hook the SPRING COIL ① between the hooks ⑪ and ⑫.
5) Perform TENSION POLE position adjustment as instructed in 6-3.
6) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

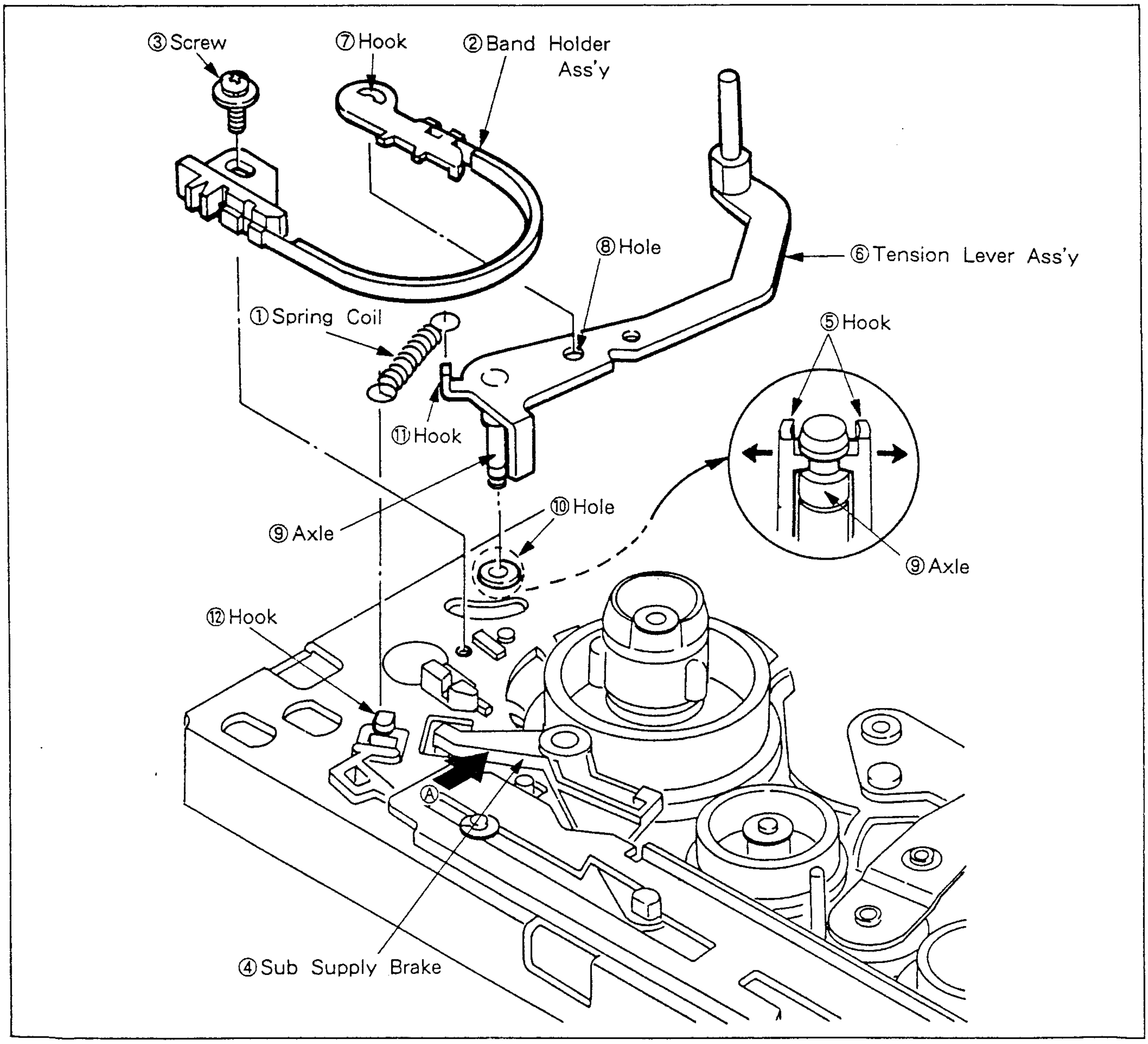

③Screw
⑦Hook
②Band Holder Ass'y
⑧Hole
⑥Tension Lever Ass'y
⑤Hook
①Spring Coil
⑪Hook
⑨Axle
⑩Hole
⑨Axle
⑫Hook
Ⓐ
④Sub Supply Brake

Fig. 5-7-3. Tension Lever Ass'y & Band Holder Ass'y

5-7-4. Capstan Brake Ass'y (See Fig. 5-7-4.)

1. Removal

1) Remove the SPRING COIL ①.
2) Unhook the hook ②, then remove the CAPSTAN BRAKE ASS'Y ③.

2. Remounting

1) Mount the CAPSTAN BRAKE ASS'Y ③ onto the axle ④. Confirm that the hook ② is hooked to the chassis.
2) Hook the SPRING COIL ① between hooks ⑤ and ⑥. Fix the hook ⑥ side with adhesive (use an adhesive that allows later detaching).

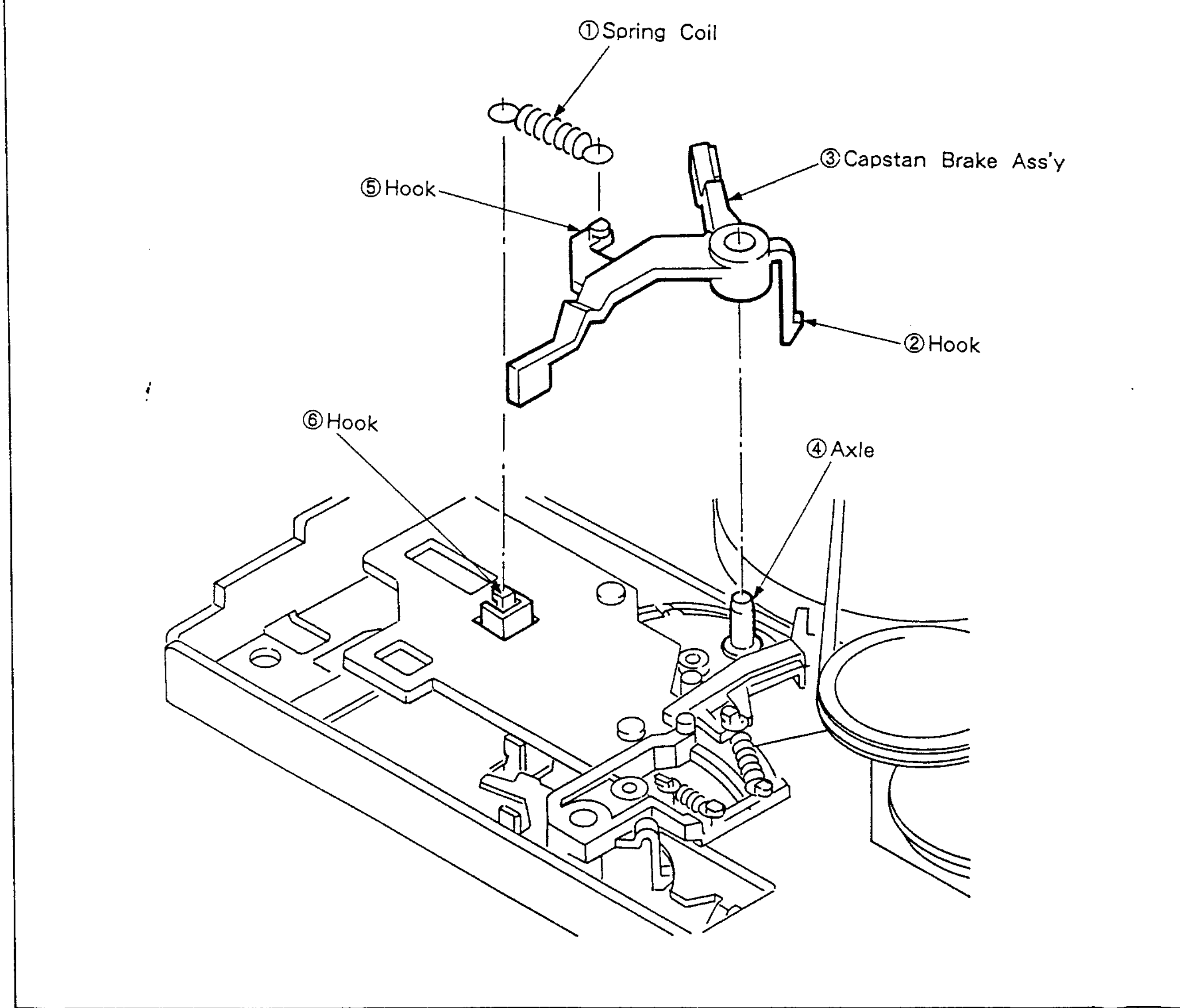

①Spring Coil
③Capstan Brake Ass'y
⑤Hook
②Hook
⑥Hook
④Axle

Fig. 5-7-4. Capstan Brake Ass'y

5-8. REEL TABLE DRIVE MECHANISM

5-8-1. Supply Reel Ass'y and Supply Reel Gear (See Fig. 5-8-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the BAND HOLDER ASS'Y as instructed in 5-7-3.
3) Set the PLAY mode with the mode selector (VHJ-0050).
4) Remove the special washer ①, then remove the SUPPLY REEL ASS'Y ② and the washer ③.
5) Remove the special washer ④.
6) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, remove the SUPPLY REEL GEAR ⑥ and the washer ⑦.

Note : Be sure that no dirt gets on the section where both brake shoes make contact.

2. Remounting

1) Apply a little oil (less than one drop) to the part of the axle ⑧ indicated by the arrow B, then mount the washer ⑦.
2) While pushing the SUPPLY BRAKE ASS'Y ⑤ in the direction of arrow A, mount the SUPPLY REEL GEAR ⑥ onto the axle ⑧.
3) Mount the special washer ④ to the axle ⑧.
4) Apply 1 drop of oil to the part of the axle ⑨ indicated by the arrow C, then mount the washer ③.
5) Mount the SUPPLY REEL ASS'Y ② onto the axle ⑨.
6) Perform reel table height adjustment as instructed in 6-2-1.
7) Mount the special washer ① onto the axle ⑨.
8) Mount the BAND HOLDER ASS'Y as instructed in 5-7-3.
9) Perform tension pole position adjustment as instructed in 6-3.
10) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

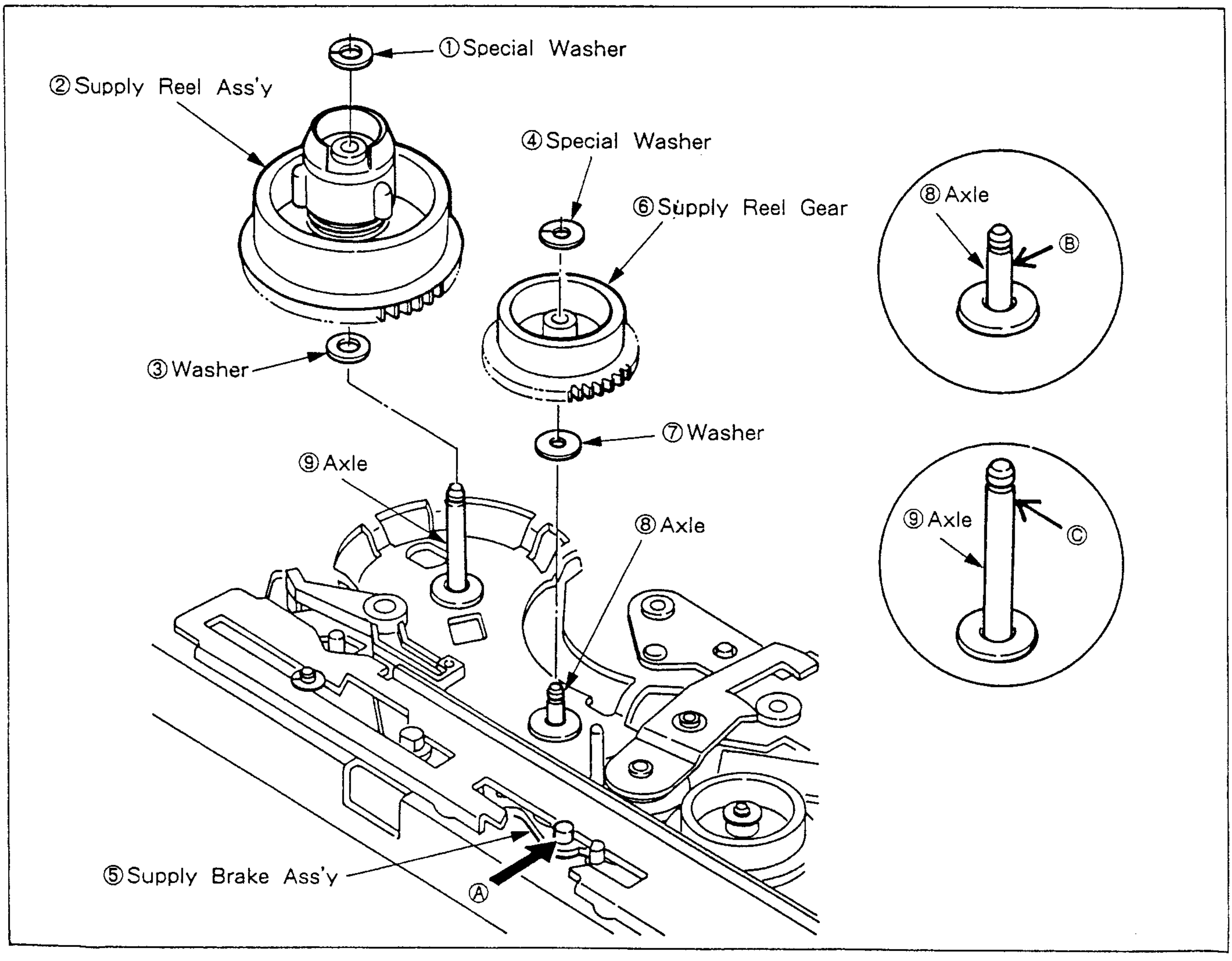


Fig. 5-8-1. Supply Reel Ass'y & Supply Reel Gear

5-8-2. Take-up Reel Ass'y (See Fig. 5-8-2.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the special washer ①.
3) Push the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A to release the brake, then remove the TAKE-UP REEL ASS'Y ③ and the washer ④.

Note : Be sure that no dirt gets on the section where both brake shoes make contact.

2. Remounting

1) Apply 1 drop of oil to the part of the axle ⑤ indicated by the arrow B, then mount the washer ④.
2) While pushing the SUB TAKE-UP BRAKE ASS'Y ② in the direction of arrow A, mount the TAKE-UP REEL ASS'Y ③ onto the axle ⑤.
3) Perform reel table height adjustment as instructed in 6-2.
4) Mount the special washer ① onto the axle ⑤.
5) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

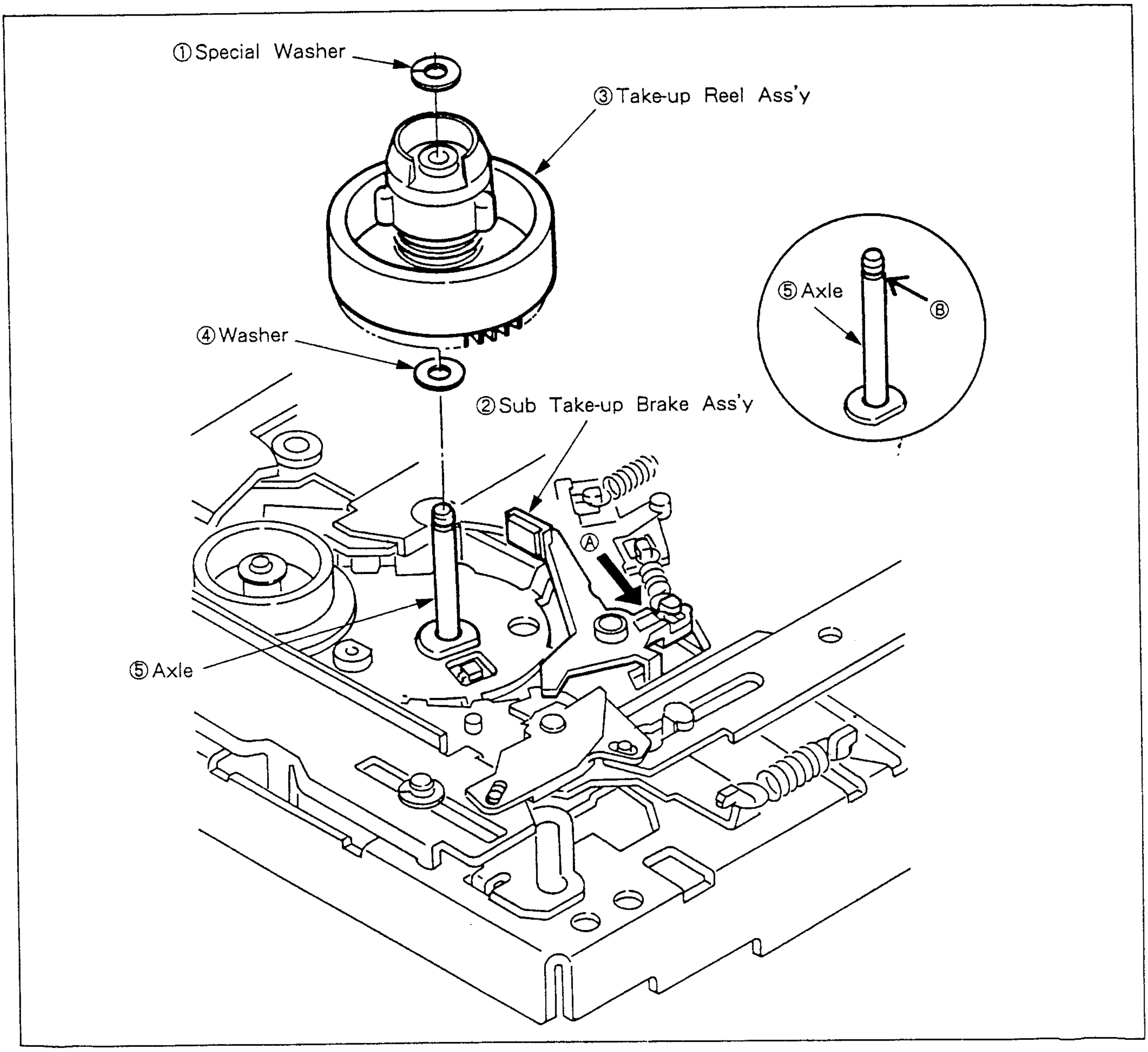


Fig. 5-8-2. Take-up Reel Ass'y

5-8-3. Take-up Reel Gear (See Fig. 5-8-3.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the TAKE-UP REEL ASS'Y as instructed in 5-8-2.
3) Remove the SUB TAKE-UP BRAKE ASS'Y as instructed in 5-7-1.
4) Remove the TAKE-UP BRAKE ASS'Y as instructed in 5-7-2.
5) Remove the special washer ①, then remove the TAKE-UP REEL GEAR ③ and the washer ④.

2. Remounting

1) Apply a little oil (less than one drop) to the part of the axle ⑤ indicated with an arrow.
2) Mount the washer ④ and the TAKE-UP REEL GEAR ③ onto the axle ⑤.
3) Mount the special washer ① onto the axle ⑤.
4) Mount the TAKE-UP BRAKE ASS'Y as instructed in 5-7-2.
5) Mount the SUB TAKE-UP BRAKE ASS'Y as instructed in 5-7-1.
6) Mount the TAKE-UP REEL ASS'Y as instructed in 5-8-2.
7) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

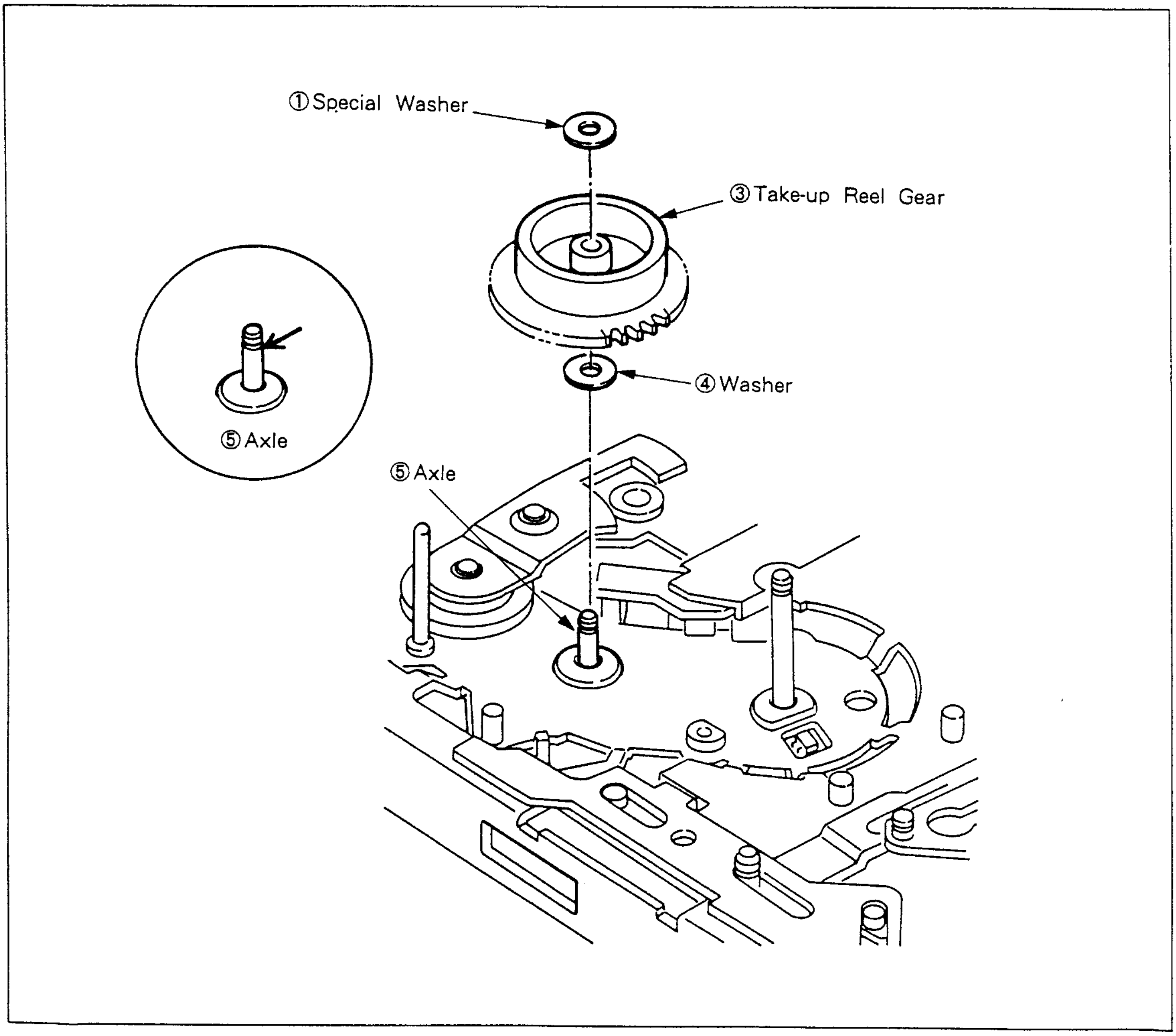


Fig. 5-8-3. TaKe-up Reel Gear

5-8-4. Reel Pulley and Friction Gear Ass'y (See Fig. 5-8-4.)

1. Removal

1) Remove the two screws ①, then remove the PULLEY BRACKET ②.
2) Remove the REEL DRIVE BELT ③.
3) Remove the special washer ④, then remove the REEL PULLEY ⑤.
4) Remove the special washer ⑥, then remove the FRICTION GEAR ASS'Y ⑦ and the washer ⑧.

2. Remounting

1) Apply one drop of oil to the parts of axles ⑨ and ⑩ indicated with an arrow.
2) Mount the washer ⑧ and the FRICTION GEAR ASS'Y ⑦ onto the axle ⑨.
3) Mount the special washer ⑥ onto the axle ⑨.
4) Mount the REEL PULLEY ⑤ onto the axle ⑩.
5) Mount the special washer ④ onto the axle ⑩.
6) Set the REEL DRIVE BELT ③.
7) Mount the PULLEY BRACKET ② with the two screws ①.

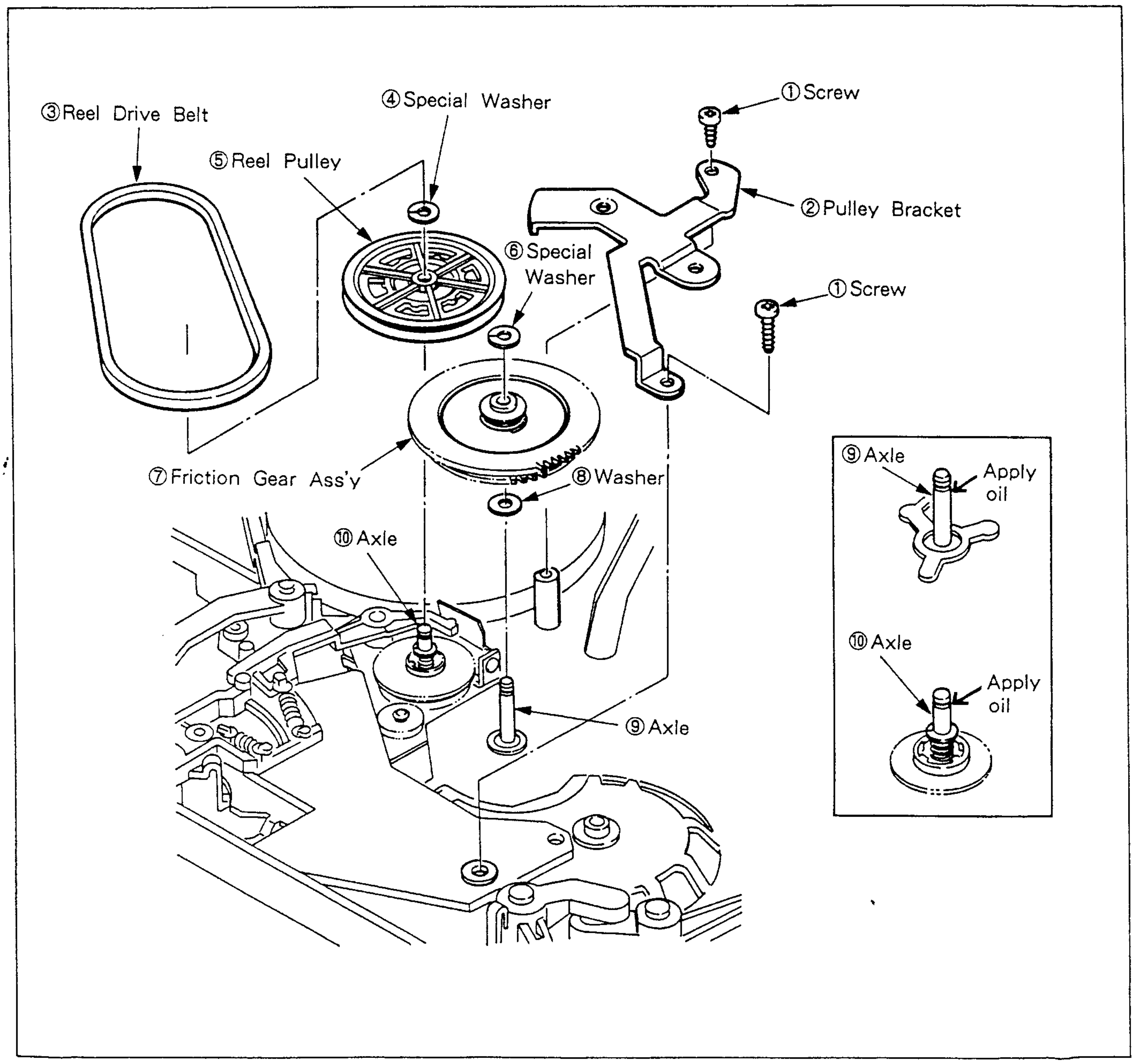

③Reel Drive Belt
④Special Washer
⑤Reel Pulley
①Screw
②Pulley Bracket
⑥Special Washer
①Screw
⑦Friction Gear Ass'y
⑧Washer
⑩Axle
⑨Axle
⑨Axle
Apply oil
⑩Axle
Apply oil

Fig. 5-8-4. Reel Pulley & Friction Gear

5-8-5. COMPL Clutch (See Fig. 5-8-5.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the screw ①, then remove the COMPL MC-4 ②.
4) Remove the two screws ③, then remove the COMPL CLUTCH ④.

2. Remounting

1) Mount the COMPL CLUTCH ④ with the two screws ③, aligning it with the protuberance ⑤.
2) After inserting the CN831 (COMPL MC-4) into the CN801 (COMPL MC-1), mount the COMPL MC-4 with the screw ①.
3) Mount the REEL PULLEY, the REEL DRIVE BELT and the PULLEY BRACKET as instructed in 5-8-4.
4) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

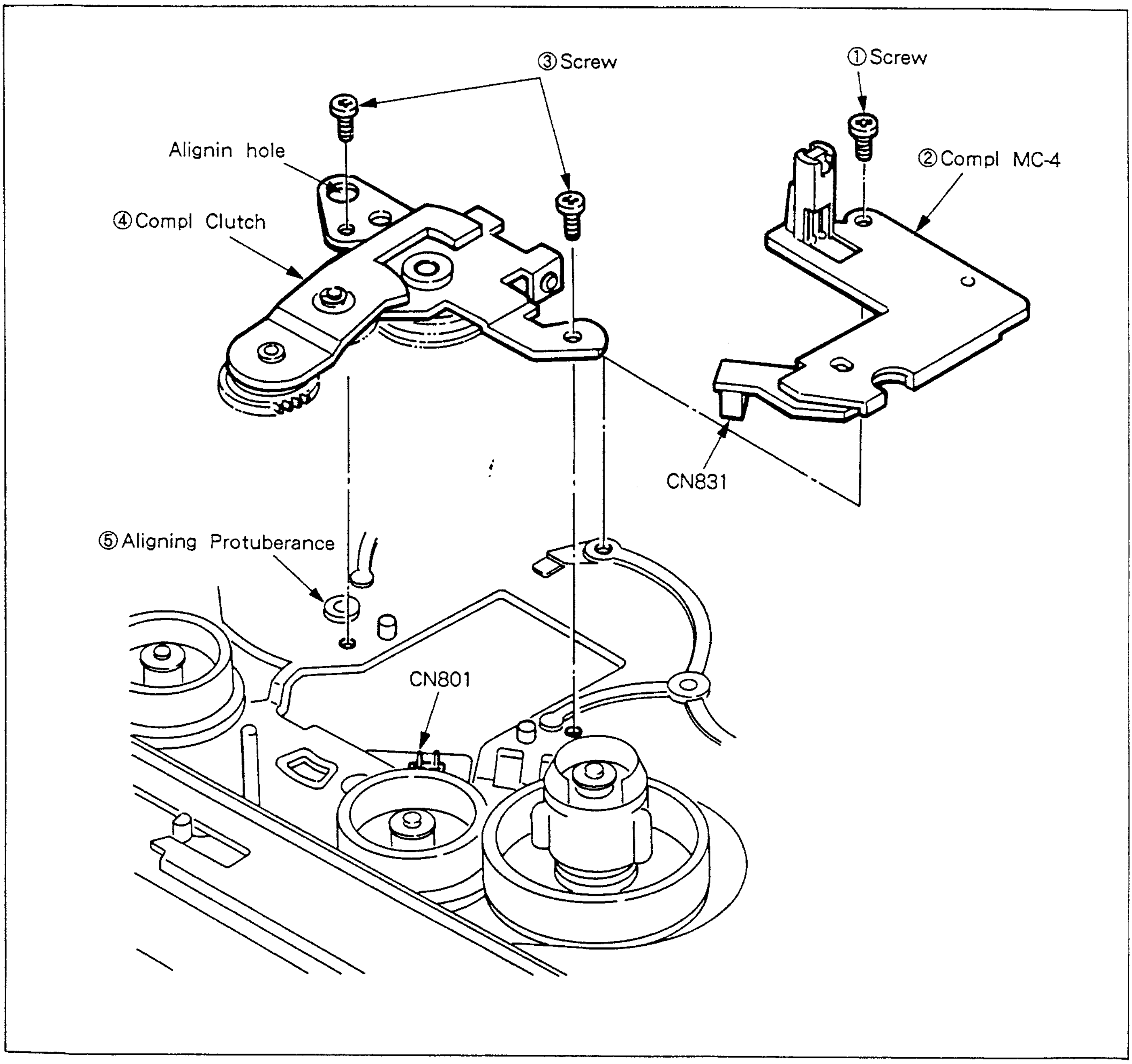

③Screw
①Screw
Alignin hole
②Compl MC-4
④Compl Clutch
CN831
⑤Aligning Protuberance
CN801

Fig. 5-8-5. **Compl Clutch**

5-8-6. Clutch Change Lever and Clutch Lever Ass'y (See Fig. 5-8-6.)

1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.
2) Remove the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the SPRING COIL ①.
4) Unhook the hook ②, then remove the CLUTCH CHANGE LEVER ③.
5) Unhook the hook ⑤, then remove the CLUTCH LEVER ASS'Y ⑥.

2. Remounting

1) Mount the CLUTCH LEVER ASS'Y ⑥ onto the axle ⑦. Confirm that the hook ⑤ is hooked to the chassis.
2) Mount the CLUTCH CHANGE LEVER ③ onto the axle ⑧. Confirm that the hook ② is hooked to the chassis.
3) Hook the SPRING COIL ① between the hooks ⑨ and ⑩.
4) Mount the PULLEY BRACKET, the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
5) Mount the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.

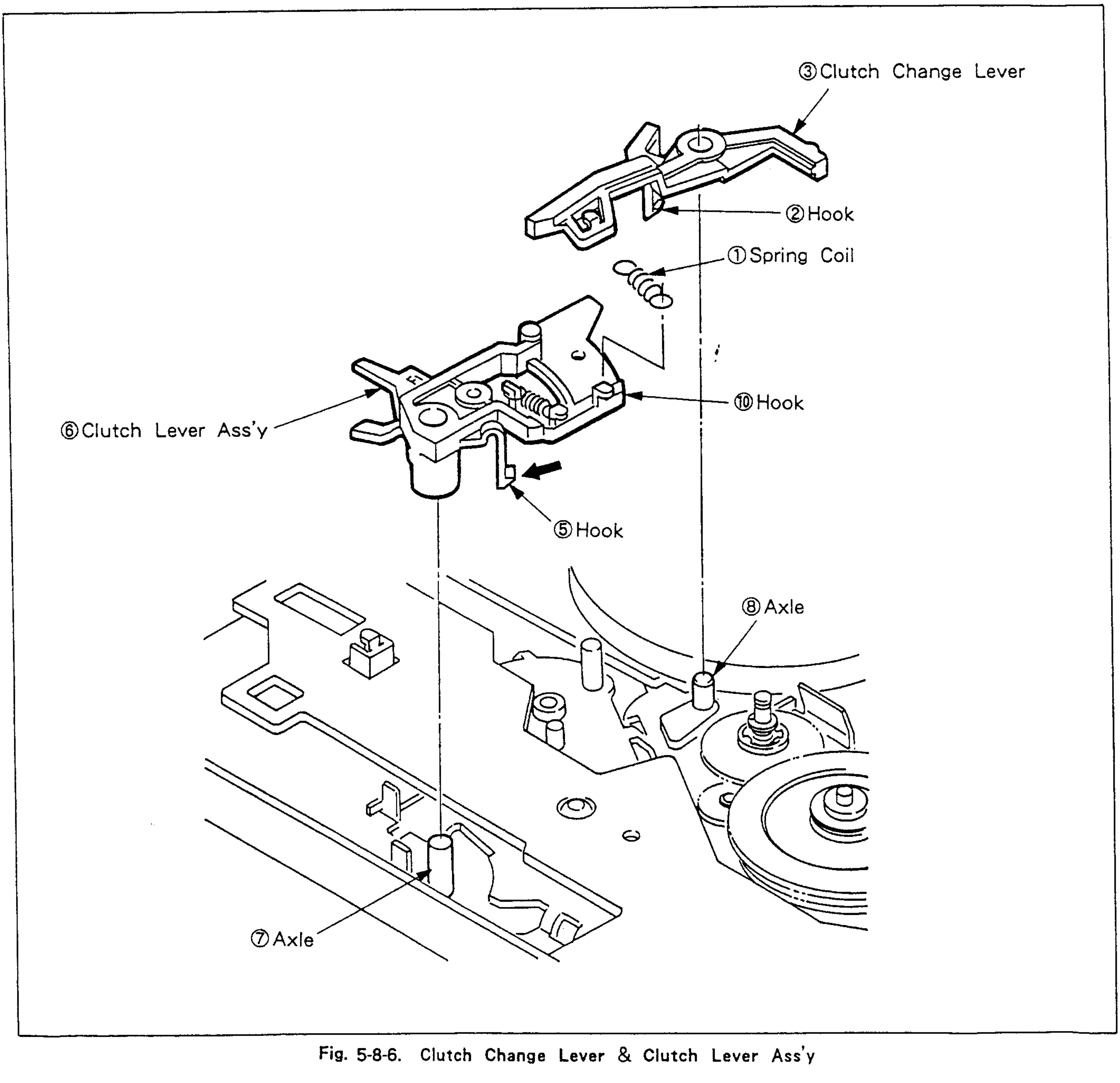


Fig. 5-8-6. Clutch Change Lever & Clutch Lever Ass'y

5-9. CAPSTAN MOTOR (See Fig. 5-9-1.)

1. Removal

1) Remove the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.
2) Remove the CAPSTAN MOTOR ⑥ connector.
3) Remove the REEL DRIVE BELT ② from the CAPSTAN MOTOR PULLEY ①.
4) Remove the two screws ④ fixing the COMPL CASSETTE MECHANISM TOP BOARD ③, then slide the TOP BOARD ③ backward.
5) Remove the three screws ⑤, then remove the CAPSTAN MOTOR ⑥.

Note : Take care not to scratch or soil the capstan axle.

2. Remounting

1) Mount the CAPSTAN MOTOR ⑥ with the three screws ⑤.
2) Connect the CAPSTAN MOTOR ⑥ connector.
3) Mount the TOP BOARD ③ with the two screws ④.
4) Fit the REEL DRIVE BELT ② around the CAPSTAN MOTOR PULLEY ① and the REEL PULLEY ⑦.
5) Mount the CAPSTAN BRAKE ASS'Y as instructed in 5-7-4.

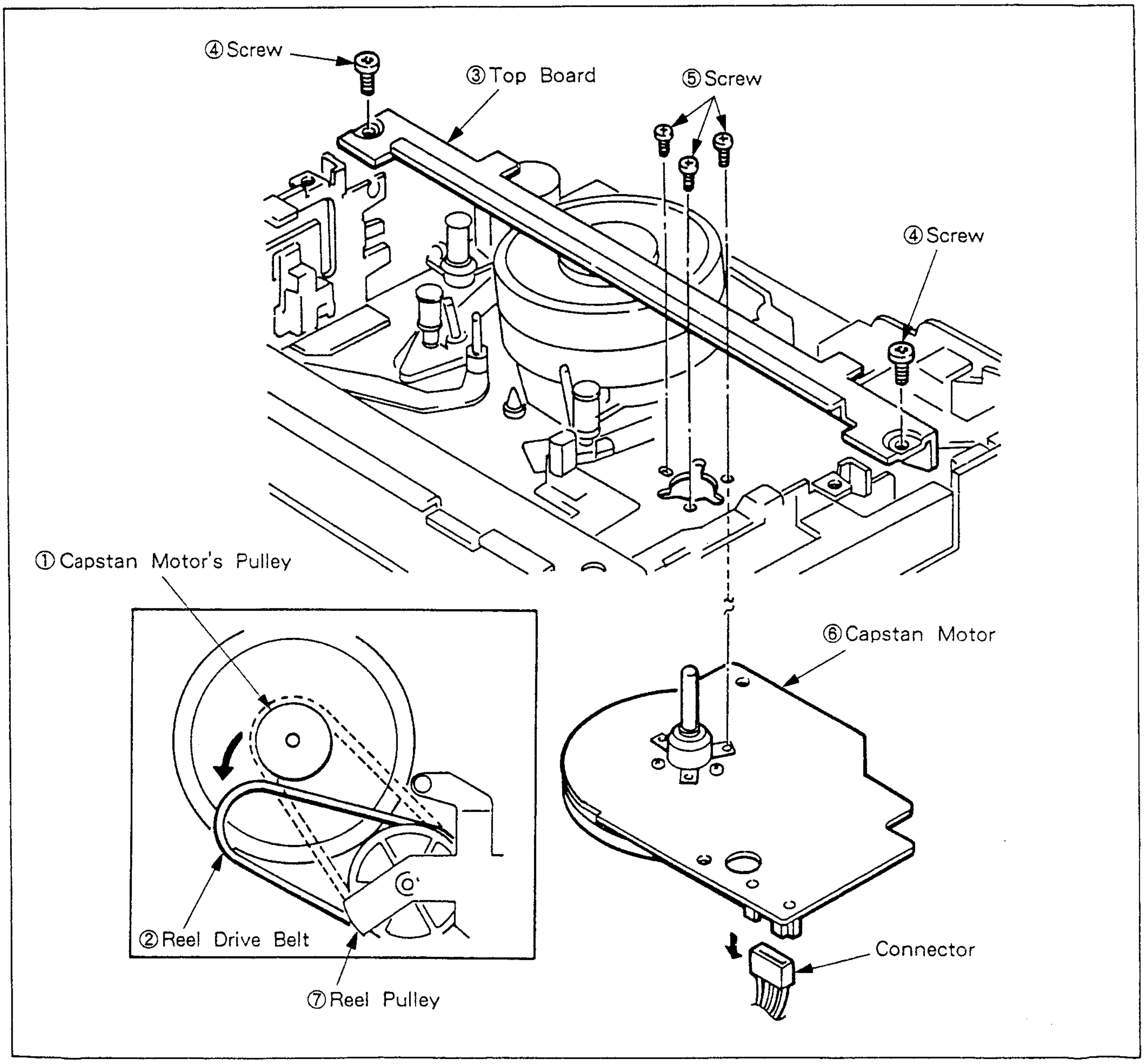

④Screw
③Top Board
⑤Screw
④Screw
①Capstan Motor's Pulley
⑥Capstan Motor
②Reel Drive Belt
Connector
⑦Reel Pulley

Fig. 5-9-1. Capstan Motor

5-10. FIXED GUIDE, FE HEAD LEVER ASS'Y

5-10-1. Entrance side Fixed Guide and FE Lever Ass'y (See Fig. 5-10-1.)

1. **Removal**

1) Remove the SP NUT ①, then remove the GUIDE PIPE ③ and the SP washer ② (lower), in that order.
2) Remove the SPRING COIL ⑤.
3) Remove the FTE HEAD connector.
4) Remove the special washer ⑥, then remove the FE HEAD LEVER ASS'Y ⑦.

Note : A SP washer ⑪ (upper) and a SPRING COIL ④ are sometimes inserted between the SP NUT ① and the special washer ⑥. In this case, put it back in its original position when remouting the entrance side fixed guide.

2. **Remounting**

1) After mounting the FE LEVER ASS'Y ⑦ onto the axle ⑧, mount the special washer ⑥.
2) Hook the SPRING COIL ⑤ between the chassis notch ⑨ and the FE LEVER ASS'Y hook ⑩.
3) Mount the SP washer ② (lower), the GUIDE pipe ③ and the SP NUT ① to the axle ⑧, in that order.
4) Connect the connector to the FTE HEAD.
5) Perform hight adjustment of the entrance side fixed guide (S) as instructed in 6-4 when remounted the SPRING COIL ④ and the SP washer ⑪ (upper).

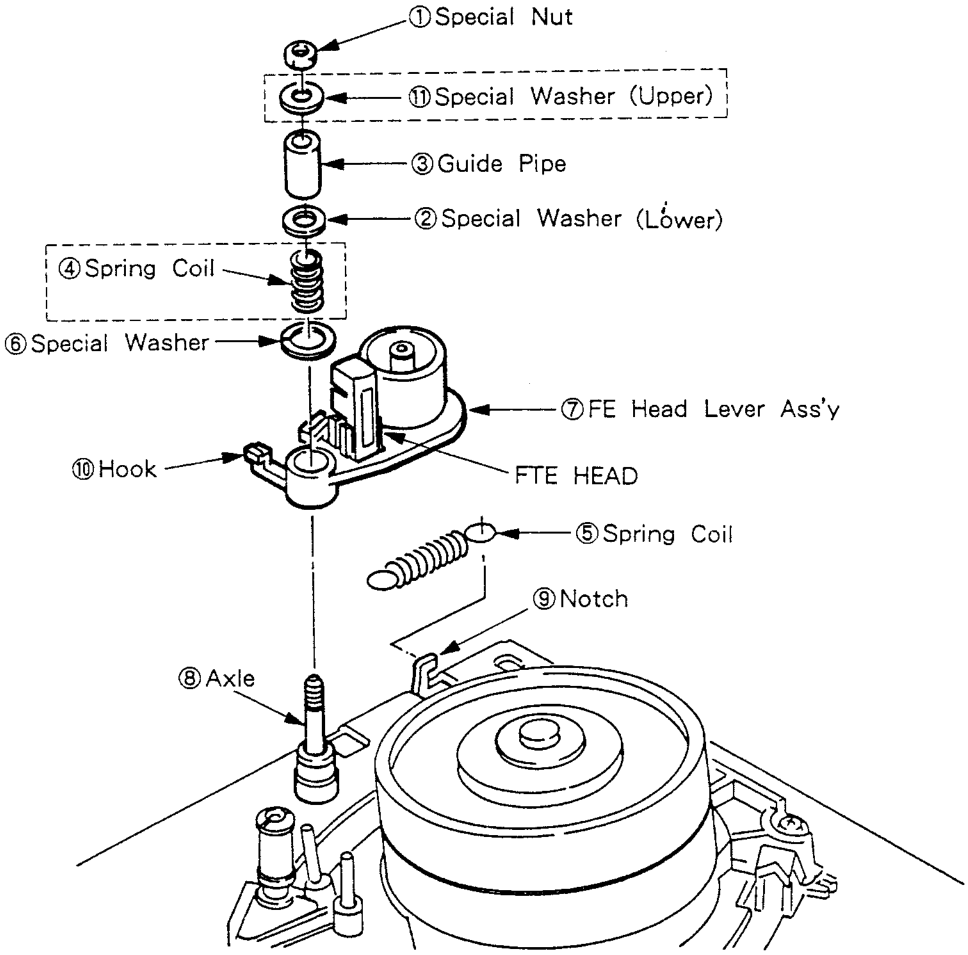

①Special Nut
⑪Special Washer (Upper)
③Guide Pipe
②Special Washer (Lower)
④Spring Coil
⑥Special Washer
⑦FE Head Lever Ass'y
⑩Hook
FTE HEAD
⑤Spring Coil
⑨Notch
⑧Axle

Fig. 5-10-1. Fixed Guide (S) & FE Lever Ass'y

5-10-2. Impedance Roller, FTE Head (See Fig. 5-10-2.)

1. Removal

1) Remove the FTE HEAD (full track erase head) ① connector.
2) Remove the special washer ②, then remove the IMPEDANCE ROLLER ③ and the washer ④.
3) Open the hook ⑤ a little and remove the FTE HEAD ①.

Note : Take care not to open the hook too much, otherwise it may be deformed or broken.

2. Remounting

1) Mount the FTE HEAD ① onto the FE HEAD LEVER ASS'Y ⑥. Confirm that the hook ⑤ is hooked to the FTE HEAD ①.
2) Mount the washer ④ and the IMPEDANCE ROLLER ③, in that order, onto the axle ⑦, then mount the special washer ②.
3) Connect the connector to the terminal of the FTE HEAD ①.

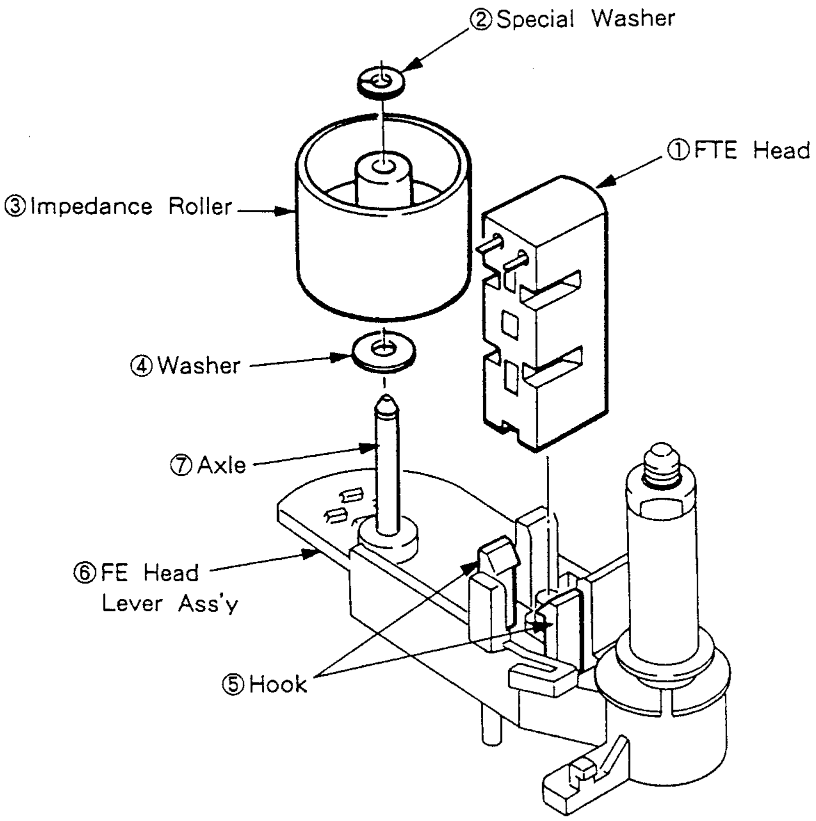

②Special Washer
①FTE Head
③Impedance Roller
④Washer
⑦Axle
⑥FE Head Lever Ass'y
⑤Hook

Fig. 5-10-2. Impedance Roller & FTE Head

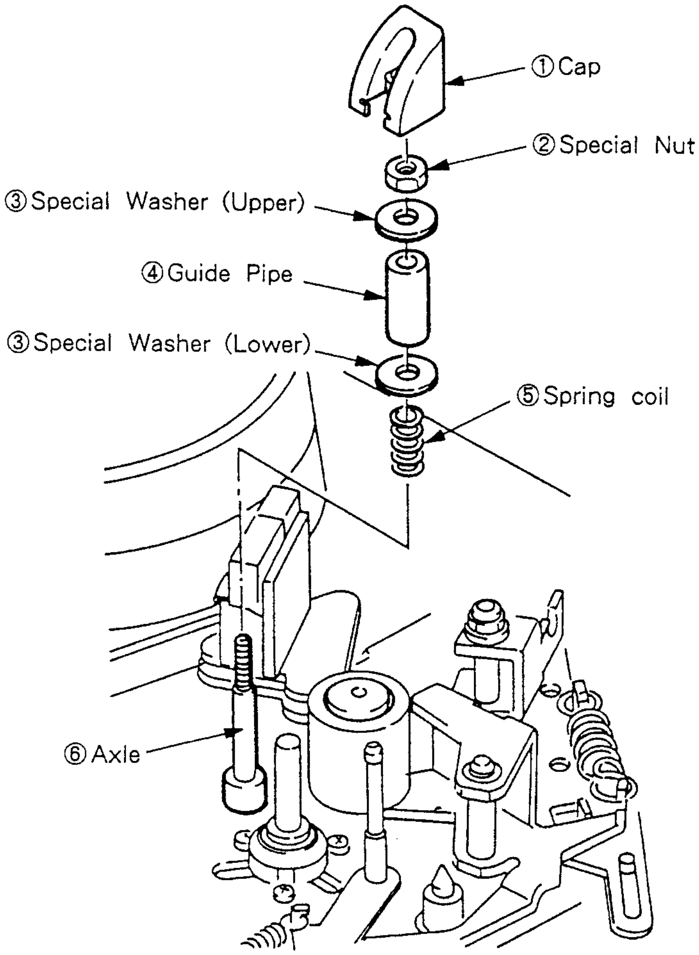
5-10-3. Exit side Fixed Guide (See Fig. 5-10-3.)

1. Removal

1) Remove the CAP ①.
2) Remove the SP NUT ②, then remove the SP washer ③ (upper), the GUIDE PIPE ④, the SP washer ③ (lower) and the SPRING COIL ⑤, in that order.

2. Remounting

1) Mount the SPRING COIL ⑤, the SP washer ③ (lower), the GUIDE PIPE ④, the SP washer ③ (upper) and the SP NUT ②, in that order, to the axle ⑥.
2) Mount the CAP ① onto the axle ⑥.
3) Perform height adjustment of the fixed guide (T) as instructed in 6-4.



①Cap
②Special Nut
③Special Washer (Upper)
④Guide Pipe
③Special Washer (Lower)
⑤Spring coil
⑥Axle

Fig. 5-10-3. Fixed Guide (T)

5-11. DRUM SECTION

5-11-1. Drum Motor (rotor, stator) (See Fig. 5-11-1.)

1. Removal

1) Remove the screw ①, then remove the CYLINDER EARTH ASS'Y ②.
2) Remove the two screws ③, then remove the ROTOR ④ and SPACER.
3) Remove the STATOR board connector ⑩.
4) Remove the three screws ⑤, then remove the STATOR ⑥.

2. Remounting

1) Mount the STATOR ⑥ with the three screws ⑤.
2) Mount the SPACER ⑪ on to the AXLE ⑫.
3) While aligning the ROTOR oval hole ⑦ with the ROTOR DISK hole ⑧, mount the ROTOR with the two screws ③.
4) Insert the connector ⑩.
5) While aligning the CYLINDER EARTH ASS'Y ② protuberance with the chassis hole ⑨, mount it with the screw ①.

Note 1 : Use a torque driver (VHJ-0014) for mounting the STATOR ⑥ and the ROTOR ④. Set fastening torque to 3kg-cm.

Note 2 : When the drum unit has been replaced, perform a tape path adjustment as instructed in 6-4. and perform a CH-1/CH-2 switching position adjustment of the servo circuit.

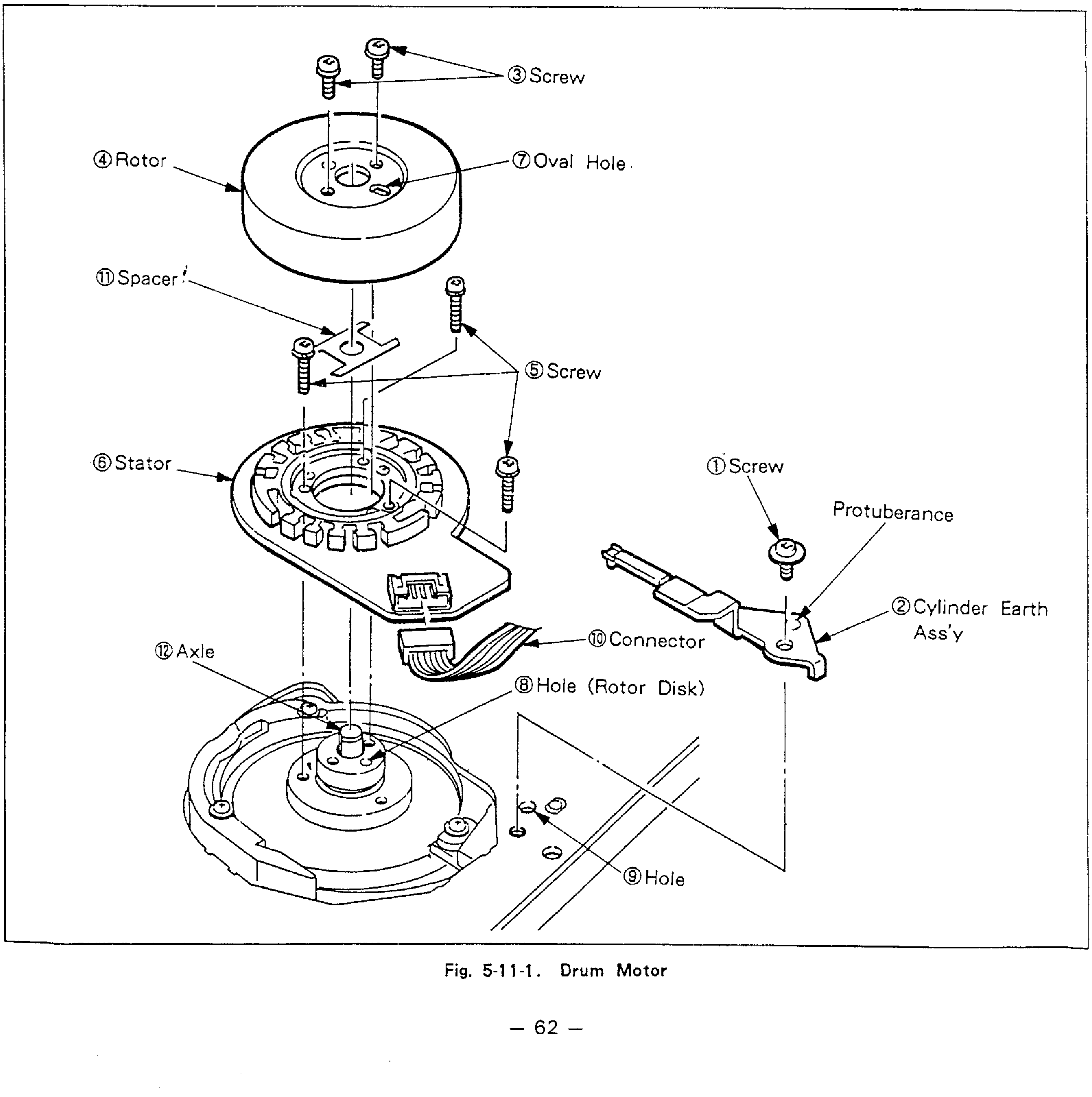

③Screw
④Rotor
⑦Oval Hole
⑪Spacer
⑤Screw
⑥Stator
①Screw
Protuberance
②Cylinder Earth Ass'y
⑩Connector
⑫Axle
⑧Hole (Rotor Disk)
⑨Hole

Fig. 5-11-1. Drum Motor

5-11-2. Drum Unit (See Fig. 5-11-2.)

1. Removal

1) For some models with the board located above the upper drum, remove the board.
2) Remove the flexible P.C.B. ① from the PRE-AMP UNIT (take care not to pull the flexible P.C.B. in the upward direction).
3) Remove the LOAD RACK only, as instructed in 5-4-1.
4) Remove the three screws ②, then remove the drum unit ③.
   NOTE : When removing and remounting the drum unit, handle it carefully to protect it from scratches and dirt.

2. Remounting

1) While aligning the drum unit ③ to the protuberance, mount it to the drum base (CYLINDER BASE) ⑤ with the three screws ②.
2) Mount the ROAD RACK as instructed in 5-4-1.
3) Insert the flexible P.C.B. into the PRE-AMP UNIT.
4) Clean the drum unit.
5) Perform the tape path adjustment as instructed in 6-4. and perform the CH-1/CH-2 switching position adjustment of the servo circuit.

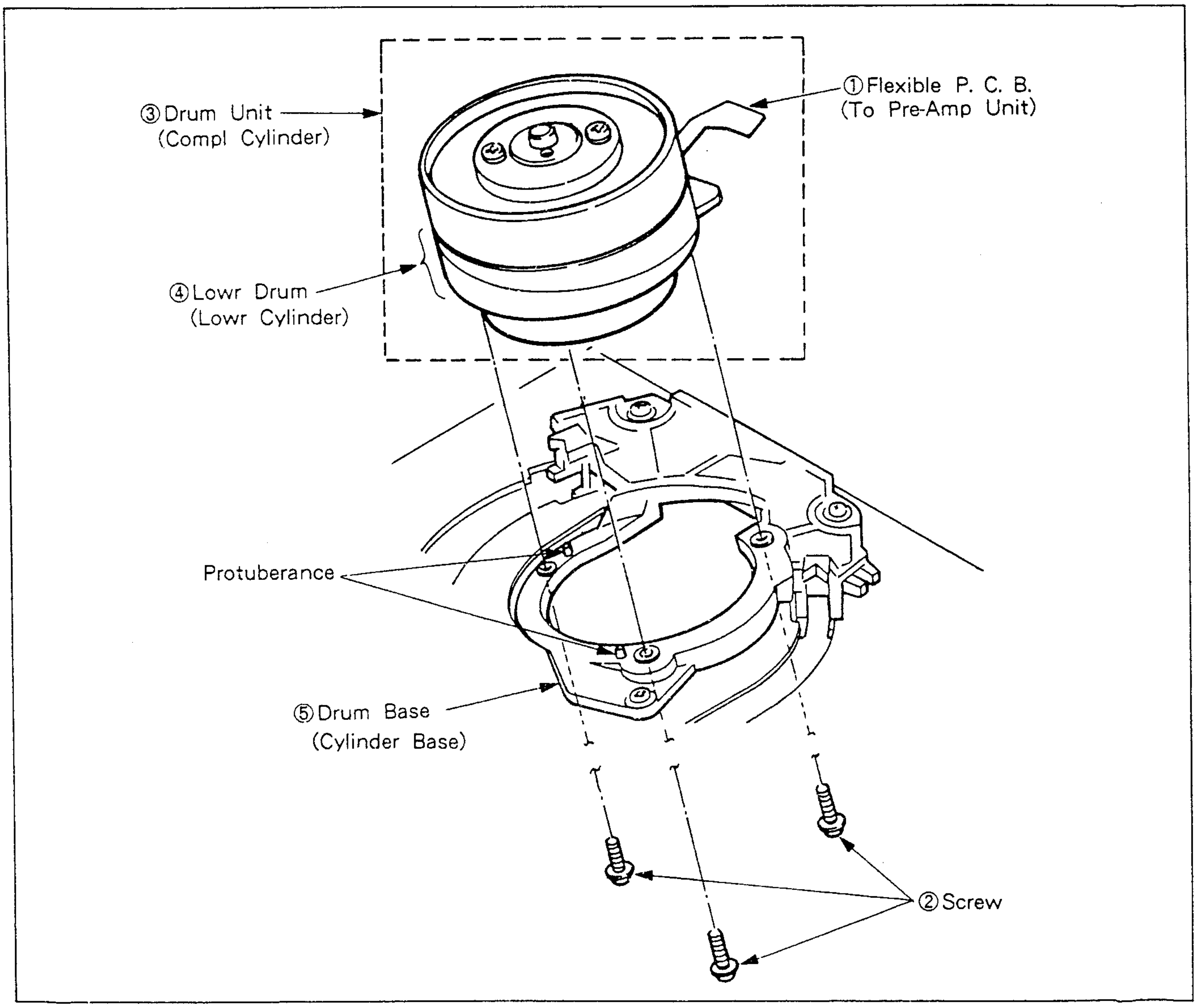

③Drum Unit
(Compl Cylinder)
①Flexible P. C. B.
(To Pre-Amp Unit)
④Lowr Drum
(Lowr Cylinder)
Protuberance
⑤Drum Base
(Cylinder Base)
②Screw

Fig. 5-11-2 Drum Unit (Compl Cylinder)

5-11-3. Upper Drum (Upper Cylinder)

1. Removal

1) Remove the two screws ① (see Fig. 5-11-3).
2) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum (UPPER CYLINDER), remove the lead wires soldered from the P.C. board (see Fig. 5-11-4.).
3) Turn the head removing jig (VHJ-0041) handle ② counterclockwise to lift up the stopper ③ (see Fig. 5-11-5.).
4) Insert the two long screws ④ of the jig into the screw holes ⑥ located on the head chip side of the upper drum (UPPER CYLINDER) ⑤, then mount by turning the handle clockwise.
5) While holding the jig so that the upper drum ⑤ does not rotate, turn the handle ② clockwise to remove the upper drum.
6) Remove the jig from the upper drum.

Note : Handle parts carefully to protect the drum from scratches and dirt, and the video head from damage.

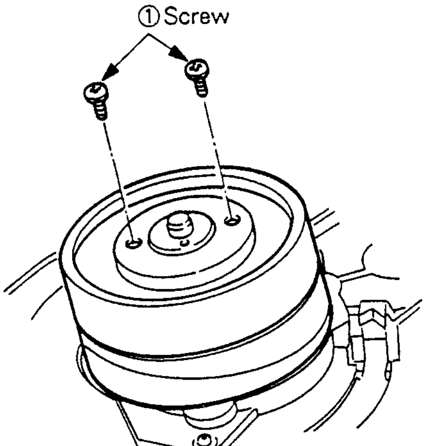


Fig. 5-11-3

Lead wires of Rotary Erase Head (Model for flying erase capability)

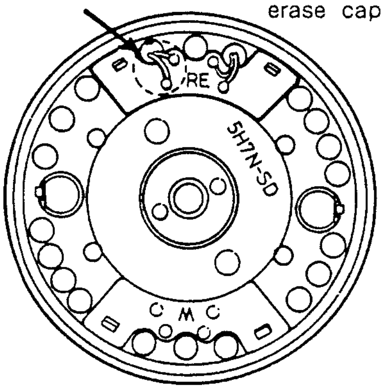

RE
5H7N-SD
C M C

Fig. 5-11-4

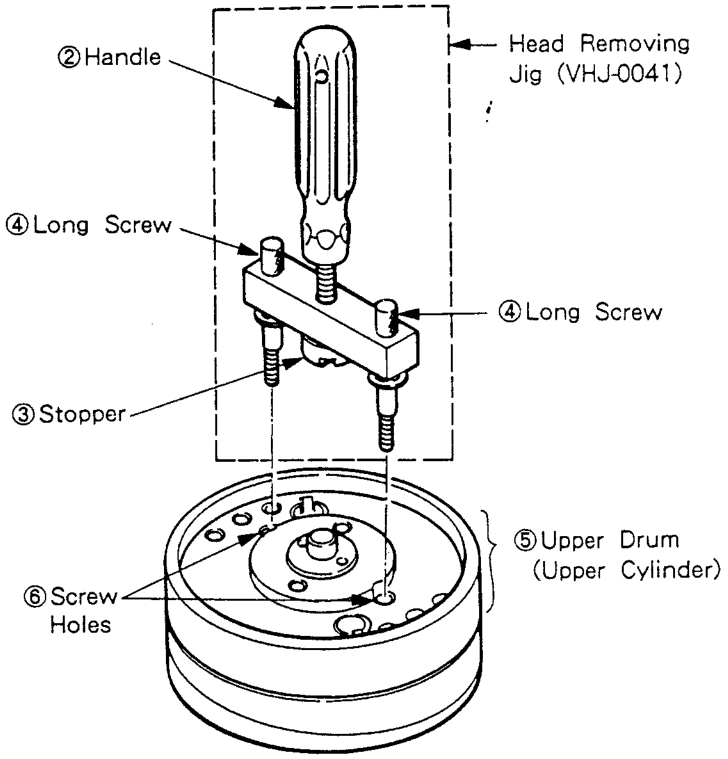

②Handle
Head Removing Jig (VHJ-0041)
④Long Screw
④Long Screw
③Stopper
⑤Upper Drum (Upper Cylinder)
⑥Screw Holes

Fig. 5-11-5

Upper Drum (Upper Cylinder)

2. Remounting (See Fig. 5-11-6.)

1) Confirm that surfaces where the flywheel and the upper drum (UPPER CYLINDER) are engaged or make contact portion are free from scratches and dirt.

2) The code name ① of the drum is printed on the video head side of the upper drum ⑤ SP CH-1 (channel A, plus azimuth). The code name ① is set with in the rotary transformer terminal round hole side ② position of lower drum (LOWER CYLINDER), so that the two screw holes ③ of the upper drum are aligned with the two screw holes ④ of the flywheel. (Refer to 3. Recognizing the SP CH-1 Head side).

3) In case the RE (ROTARY ERASE) HEAD is attached to the upper drum, pass the lead wires through the lead wire hole. (See Fig.5-11-4.)

4) While keeping the upper drum ⑤ parallel to the lower drum (LOWER CYLINDER) ⑧, insert it completely into the flywheel.

5) Temporarily tighten the two screws ⑦ alternately a little at a time, then tighten them to a torque of 6kg-cm using a torque driver (VHJ-0014) and a 3mm bit (VHJ-0045).

6) In case the RE head is attached to the upper drum ⑤, solder the lead wires to the P.C. board. Solder the red lead wire to the R terminal, and the yellow lead wire to the Y terminal.

Note : When the upper drum has been replaced, perform a tape path adjustment as instructed in 6-4. and CH-1/CH-2 switching position adjustment of the servo circuit.

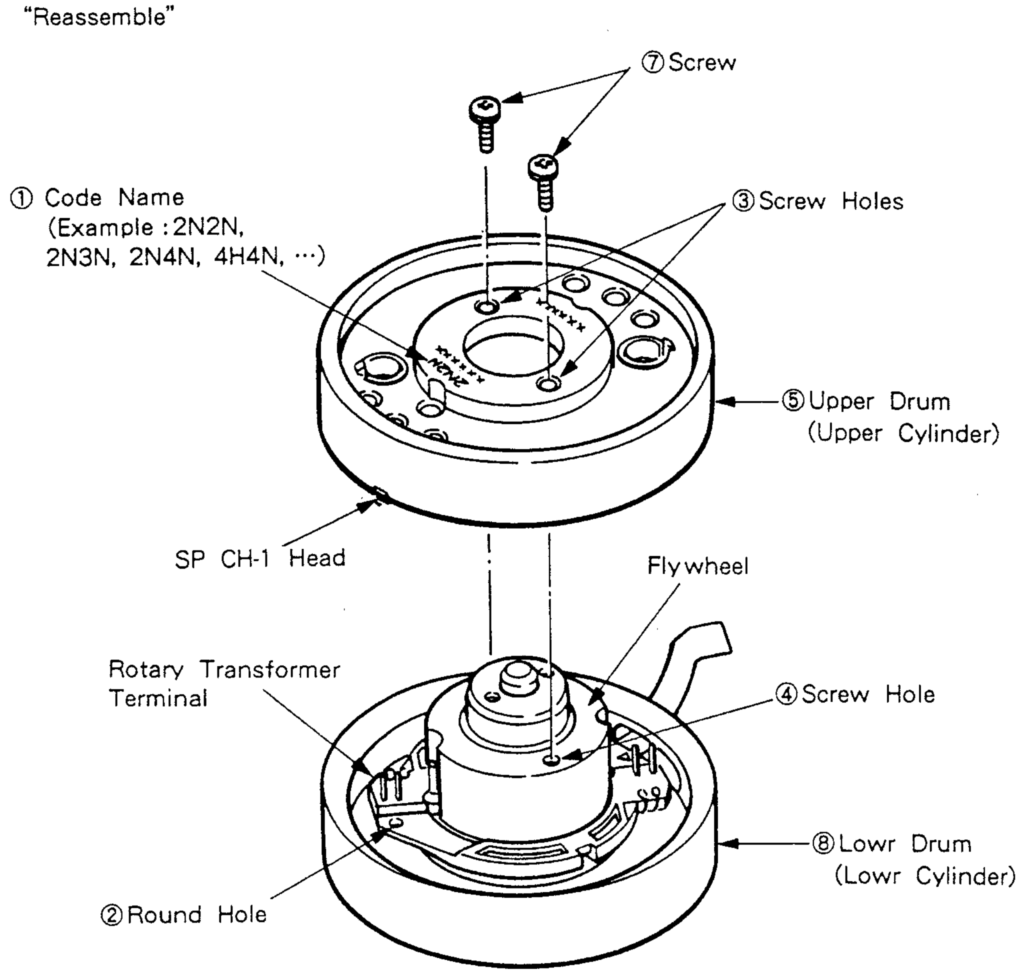
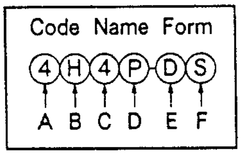

"Reassemble"
⑦ Screw
① Code Name (Example : 2N2N, 2N3N, 2N4N, 4H4N, …)
③ Screw Holes
⑤ Upper Drum (Upper Cylinder)
SP CH-1 Head
Flywheel
Rotary Transformer Terminal
④ Screw Hole
⑧ Lowr Drum (Lowr Cylinder)
② Round Hole

Fig. 5-11-6.

3. Recognizing the SP CH-1 Head Side

No playback picture can be obtained if the video head is not wired as a pair with the rotary transformer located inside the lower drum rotating section. Therefore, mounting position should be matched when mounting the upper drum. In the P90 mechanism series, the code name of the drum is printed on the SP CH-1 (CH-A, plus azimuth) side as a mark for mounting the upper drum. (See Fig. 5-11-7.) This code name differs according to the drum type, but its basic form is as follows :

A = Number of head bases
B = "N" for normal audio
"H" for HI-FI audio
C = Number of heads
D = TV system ("N" or "P")
EF = Code for detailed classification. Depending on drum type, it can also be just one character, or a blank space.


Code Name Form
④Ⓗ④Ⓟ-ⒹⓈ
A B C D E F

Examples of Detailed Classification Codes
V = Head with level difference
D = Compatible with digital units
S = SVHS-compatible

Examples of Code Names
2N2P, 2N2P-L, 2N2P-V, 2N2P-D, 2N3P, 2N4P, 4H4P, 4H4P-D

Moreover, there is a round hole with marking purposes on the SP CH-1 (CH-A, plus azimuth) side of the lower drum rotary transformer terminal. As shown in Fig. 5-11-8, there are two types of rotary transformer terminals (the number of pins differs according to the number of heads).

Note : When ordering parts such as drums (CYLINDERS), do not use the code names; always refer to the parts list and order with the specified part numbers.

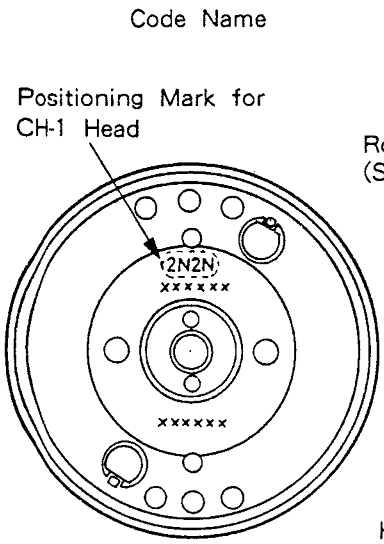

Code Name
Positioning Mark for CH-1 Head
2N2N
xxxxxx
xxxxxx

Fig. 5-11-7. Upper Drum

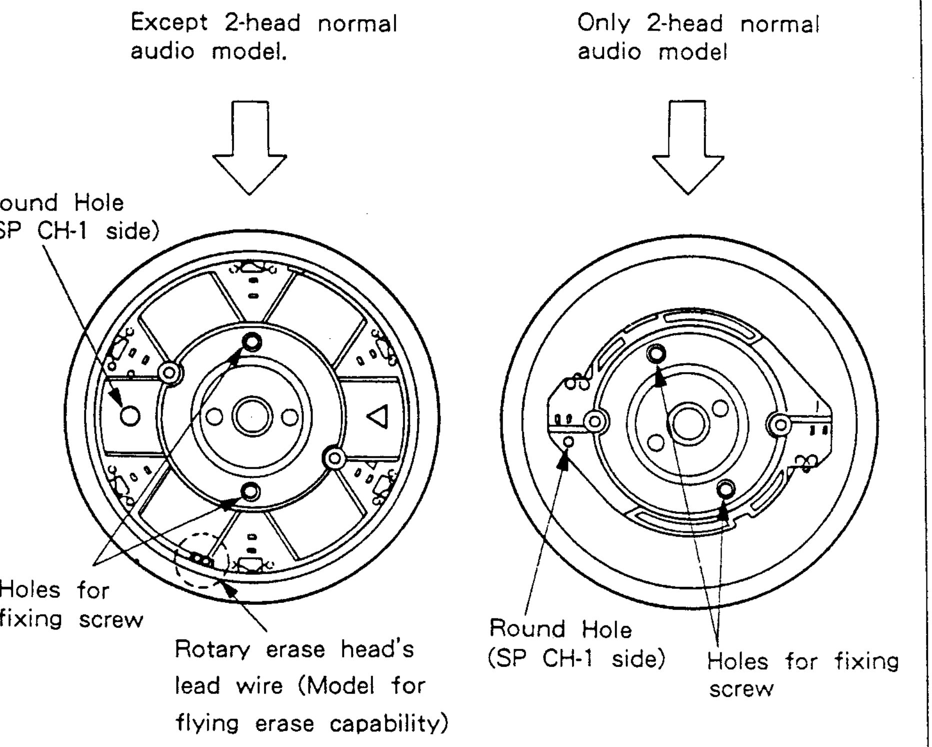
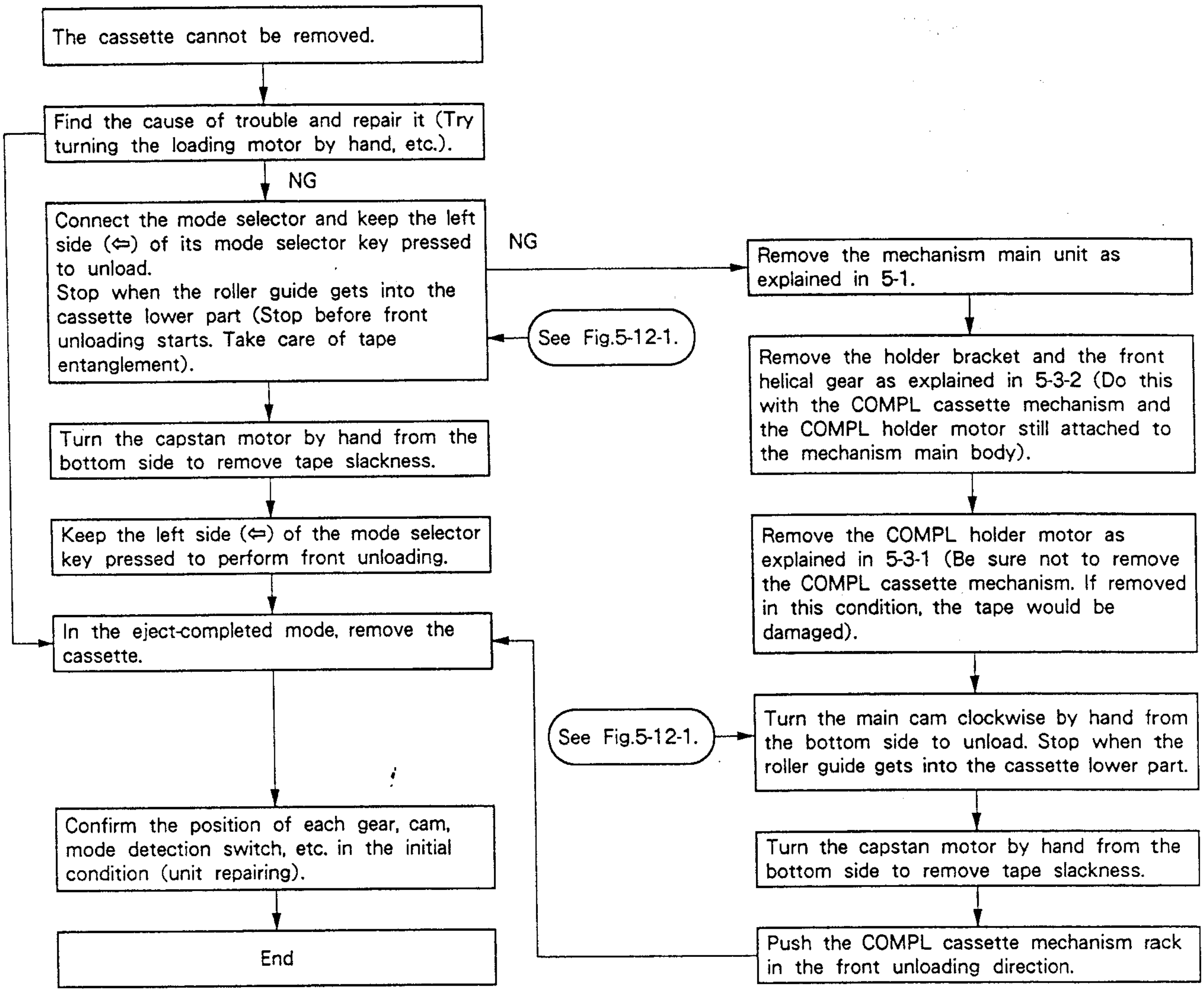

Except 2-head normal audio model.
Only 2-head normal audio model
Round Hole (SP CH-1 side)
Holes for fixing screw
Rotary erase head's lead wire (Model for flying erase capability)
Round Hole (SP CH-1 side)
Holes for fixing screw

Fig. 5-11-8. Lower Drum

5-12. HOW TO PROCEED WHEN THE CASSETTE CANNOT BE REMOVED



The cassette cannot be removed.

Find the cause of trouble and repair it (Try turning the loading motor by hand, etc.).

NG

Connect the mode selector and keep the left side (⇦) of its mode selector key pressed to unload.
Stop when the roller guide gets into the cassette lower part (Stop before front unloading starts. Take care of tape entanglement).

See Fig.5-12-1.

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Keep the left side (⇦) of the mode selector key pressed to perform front unloading.

In the eject-completed mode, remove the cassette.

Confirm the position of each gear, cam, mode detection switch, etc. in the initial condition (unit repairing).

End

NG

Remove the mechanism main unit as explained in 5-1.

Remove the holder bracket and the front helical gear as explained in 5-3-2 (Do this with the COMPL cassette mechanism and the COMPL holder motor still attached to the mechanism main body).

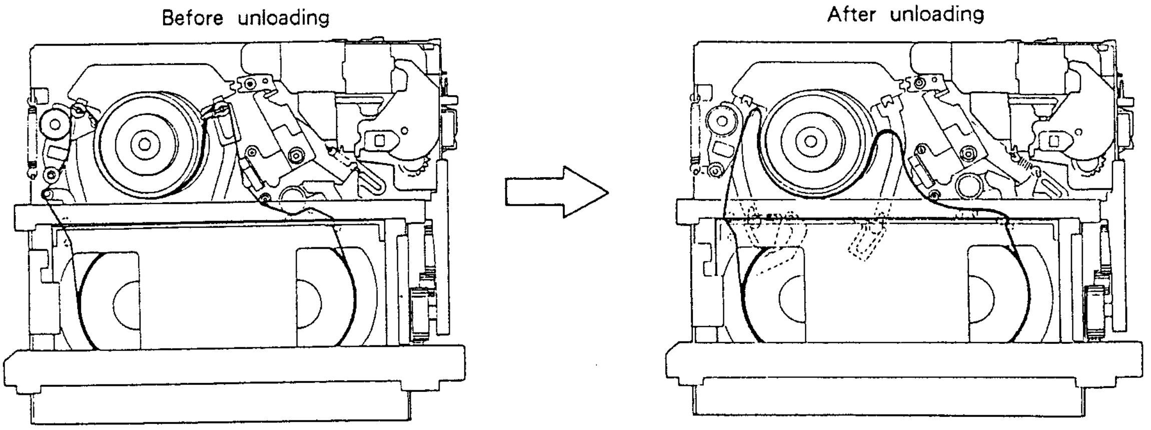
Remove the COMPL holder motor as explained in 5-3-1 (Be sure not to remove the COMPL cassette mechanism. If removed in this condition, the tape would be damaged).

See Fig.5-12-1.

Turn the main cam clockwise by hand from the bottom side to unload. Stop when the roller guide gets into the cassette lower part.

Turn the capstan motor by hand from the bottom side to remove tape slackness.

Push the COMPL cassette mechanism rack in the front unloading direction.



Before unloading

After unloading

Perform unloading using the mode selector.

First rotate the capstan motor by hand from the bottom to take-up the tape slack, and perform front-unloading using the mode selector.

Fig. 5-12-1

6. MECHANISM ADJUSTMENT

6-1. OPERATING THE MECHANISM WITH NO CASSETTE INSERTED (See Fig. 6-1-1.)

1) Attach black vinyl tape to the T. END and T. TOP sensors to prevent light from entering.
2) Push the TRAY LOCK LEVER in the direction of the arrow to maintain the unlocked condition. Release the lever just before the TRAY starts moving down.
3) In this condition, operation is possible in every mode. However, the following procedures are necessary to operate the unit in the REC, REW and R-SEARCH modes.

REC mode :	Push the SAFETY SW LEVER to turn the SAFETY SWITCH (Erasure Prevention Switch) ON, then press the REC button. If the SAFETY SWITCH is not turned ON, the unit will enter the EJECT mode.
REW/R-SEARCH :	After pressing the REW button, turn the TAKE-UP REEL ASS'Y by hand. Otherwise, the reel sensor will operate, setting the INITIAL mode after 2 to 3 seconds.

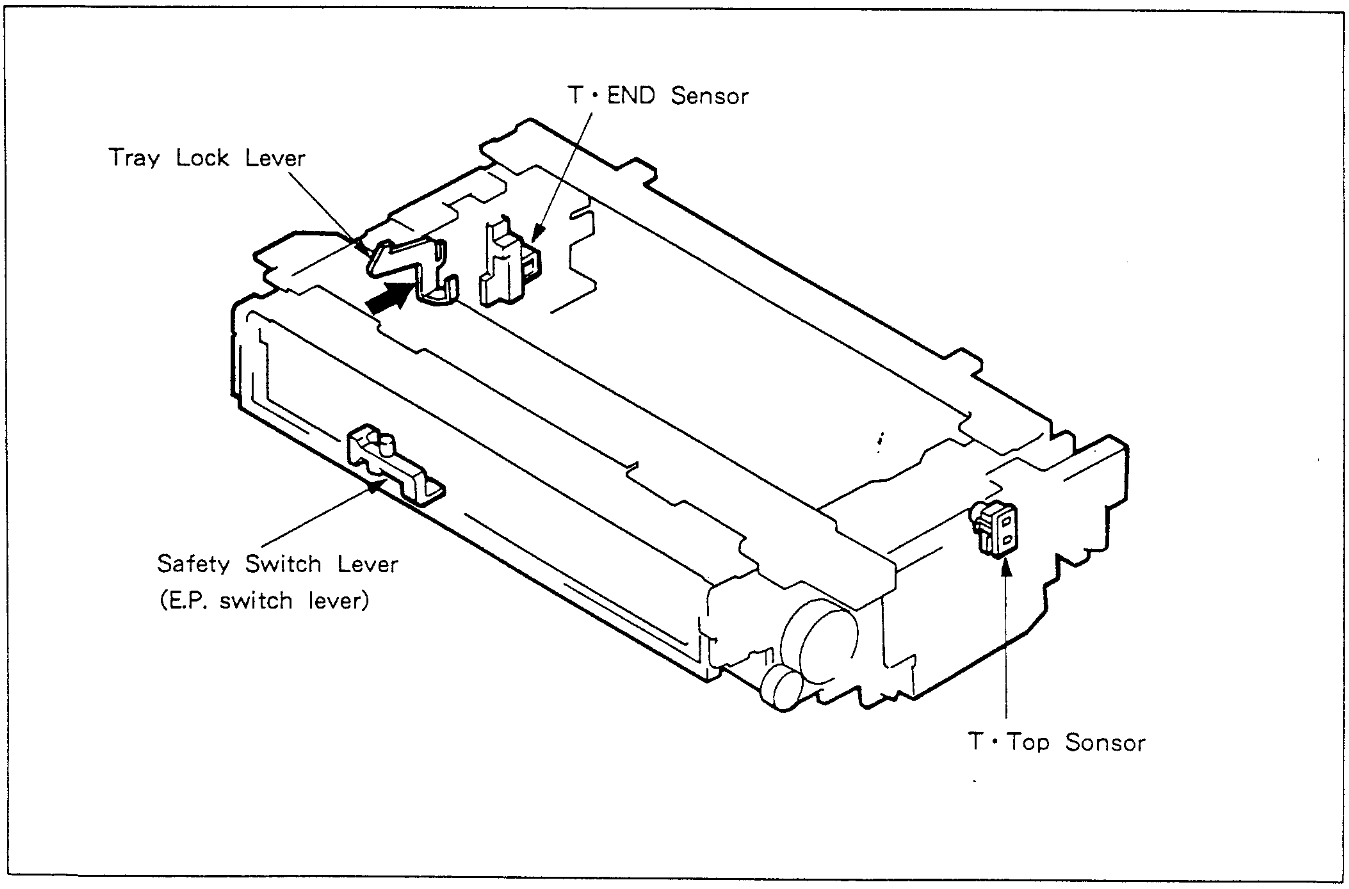


Fig. 6-1-1. Preparations for Adjustment

6-2. REEL TABLE HEIGHT ADJUSTMENT AND TORQUE CHECK

6-2-1. Reel Table Height (See Fig. 6-2-1.)

If the SUPPLY REEL ASS'Y or the TAKE-UP REEL ASS'Y is replaced, it will be necessary to adjust the REEL TABLE height.

(1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
(2) Attach the cassette stand plate gauge (VHJ-0001) and slide the gauge in the direction of the arrows.
(3) Confirm that, when the gauge stops, the REEL TABLEs are not in contact with surface A of the plate and are in contact with surface B.
(4) If the REEL TABLE is in contact with surface A, remove a spacer and check again.
(5) If the REEL TABLE is not in contact with surface B, add a spacer and check again.
(6) Remove the cassette stand plate gauge.
(7) Set the EJECT mode with the mode selector.
(8) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

Note :

- Adjust the reel table height by adding or removing spacers (0.13t, 0.25t, 0.3t, 0.4t and 0.5t) as appropriate so that the height meets the specifications. Use the same method for both the TAKE-UP REEL TABLE and the SUPPLY REEL TABLE.
  (The 0.5t washer is included as the standard washer for the SUPPLY REEL ASS'Y. The 0.4t washer is included as the standard washer for the TAKE-UP REEL ASS'Y.)
- If the height of the reel table is not within the specified value, the tape edge might be damaged as a result, or the tape path adjustment might not be possible to make.

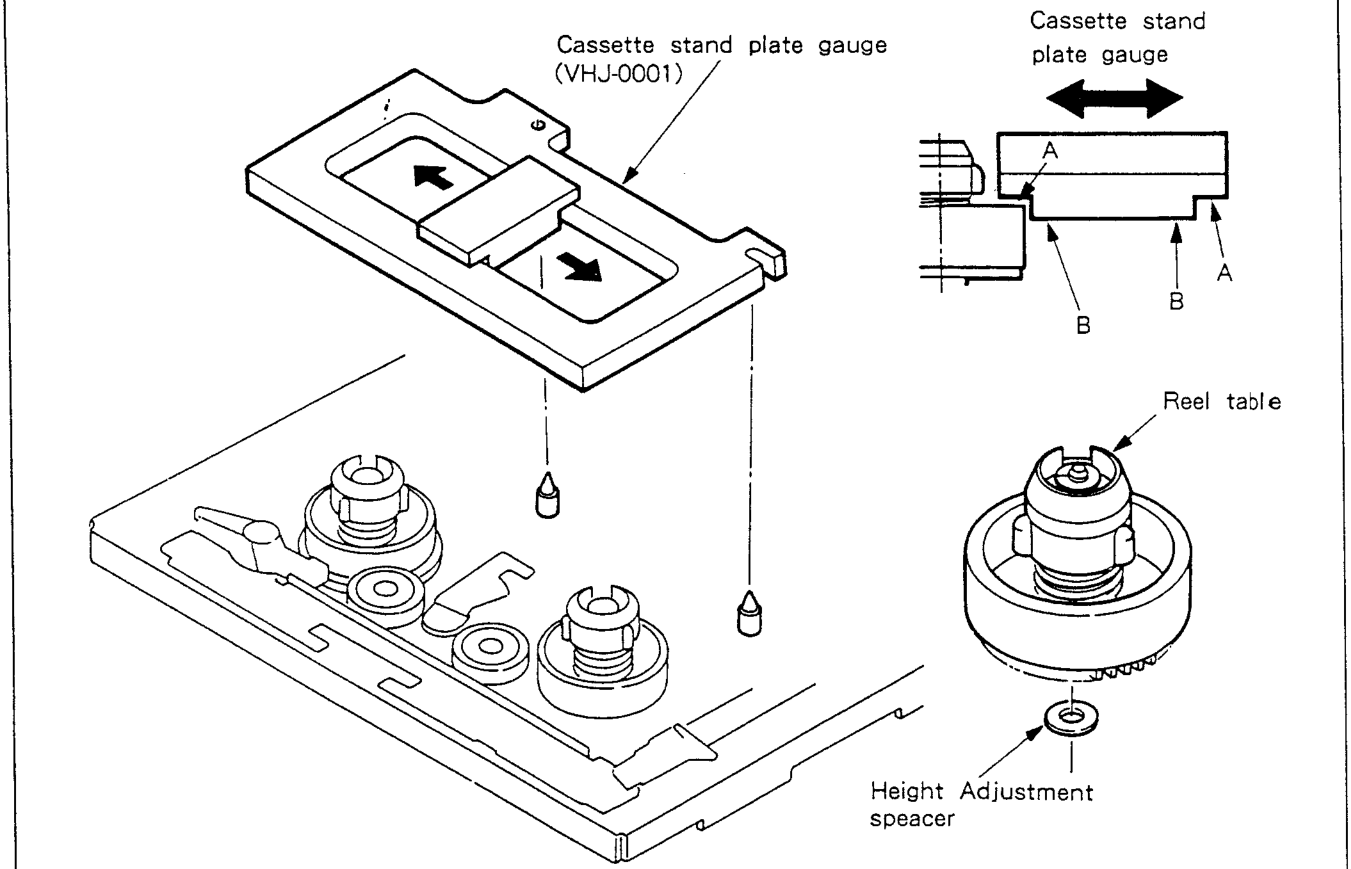


Fig. 6-2-1 . Reel Table Height Adjustment

6-2-2. Torque Check (See Fig. 6-2-2.)

1) Set the unit to operating condition without a cassette inserted as instructed in 6-1.
2) Measure the SUPPLY REEL TABLE torque in the REW mode, and confirm that it is 750gcm or more. Perform this measurement keeping the torque gauge in a fixed position with your hand (locked torque).
3) Measure the TAKE-UP REEL TABLE torque in the F.FWD mode, and confirm that it is 600gcm or more (locked torque).
4) Measure the TAKE-UP REEL TABLE torque in the playback mode (SP tape speed), and confirm that it is within 100 through 160gcm (locked torque).
5) Measure the SUPPLY REEL TABLE torque in the REV (F-SEARCH) mode, and confirm that it is within 150 through 240 gcm (locked torque).
6) After confirming that torque readings are within the specifications for each mode, check the following :
   ⓐ Dirt on the capstan motor and the REEL PULLEY groove.
   ⓑ Deterioration of the REEL DRIVE BELT.
   ⓒ Deterioration of the FRICTION GEAR ASS'Y felt (torque during playback).
   ⓓ Wear and damage of the COMPL CLUTCH MECHANISM and the reel drive system gears.

Note1 : Items ⓑ, ⓒ and ⓓ require replacement if found defective.

Note2 : The measured value of torque during FF and REW represents the value 2 seconds after starting.

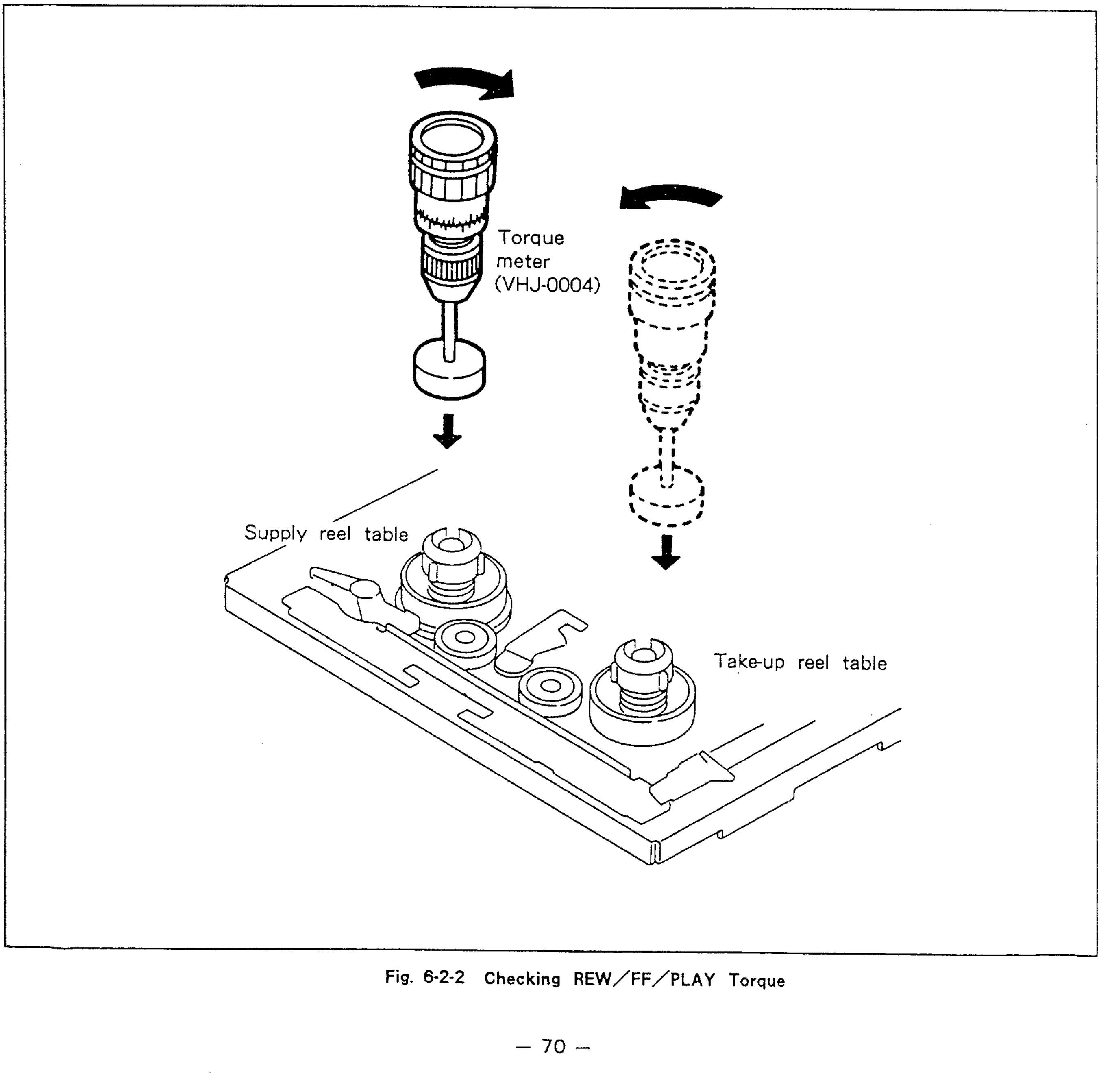


Fig. 6-2-2 Checking REW/FF/PLAY Torque

6-3. TENSION POLE (BACK TENSION GUIDE) POSITION ADJUSTMENT AND BACK TENSION TORQUE CHECK

6-3-1. Tension Pole (Back Tension Guide) Position Adjustment (See Fig. 6-3-1.)

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Set the PLAY mode with the mode selector (VHJ-0050).
3) Attach the position adjustment gauge (VHJ-0049) ①.
4) Confirm that the tension pole ② is within the position adjustment gauge frame.
5) In case the tension pole is not within the above-mentioned frame, adjust it by loosening the screw ④ a little and changing the mounting position of the BAND HOLDER ⑤ in the direction of the arrow Ⓐ.
6) Remove the position adjustment gauge ①.
7) Set the EJECT mode with the mode selector.
8) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
9) Confirm that back tension torque is within 50 ± 10gcm, as instructed in 6-3-2 below.

6-3-2. Back Tension Torque Check (See Fig. 6-3-1.)

1) Attach the cassette torquemeter (VHJ-0016) and set the PLAY mode.
2) Confirm that back tension torque is within 47 ± 5gcm.
3) In case back tension torque does not meet the above specification, proceed as follows:

ⓐ Clean the portion where the brake band (BAND HOLDER ASS'Y) ⑦ of the SUPPLY REEL ASS'Y ⑥ makes contact.

ⓑ Confirm that the brake band of the BAND HOLDER ASS'Y ⑦ does not make wear and that it is clean. If wear or dirt is found, replace the band holder assembly ⑦ as instructed in 5-7-3.

ⓒ Replace the TENSION LEVER ASS'Y SPRING COIL ⑧.

Note : Always follow procedures in 6-3-1. Tension Pole Position Adjustment after performing ⓐ, ⓑ and ⓒ.

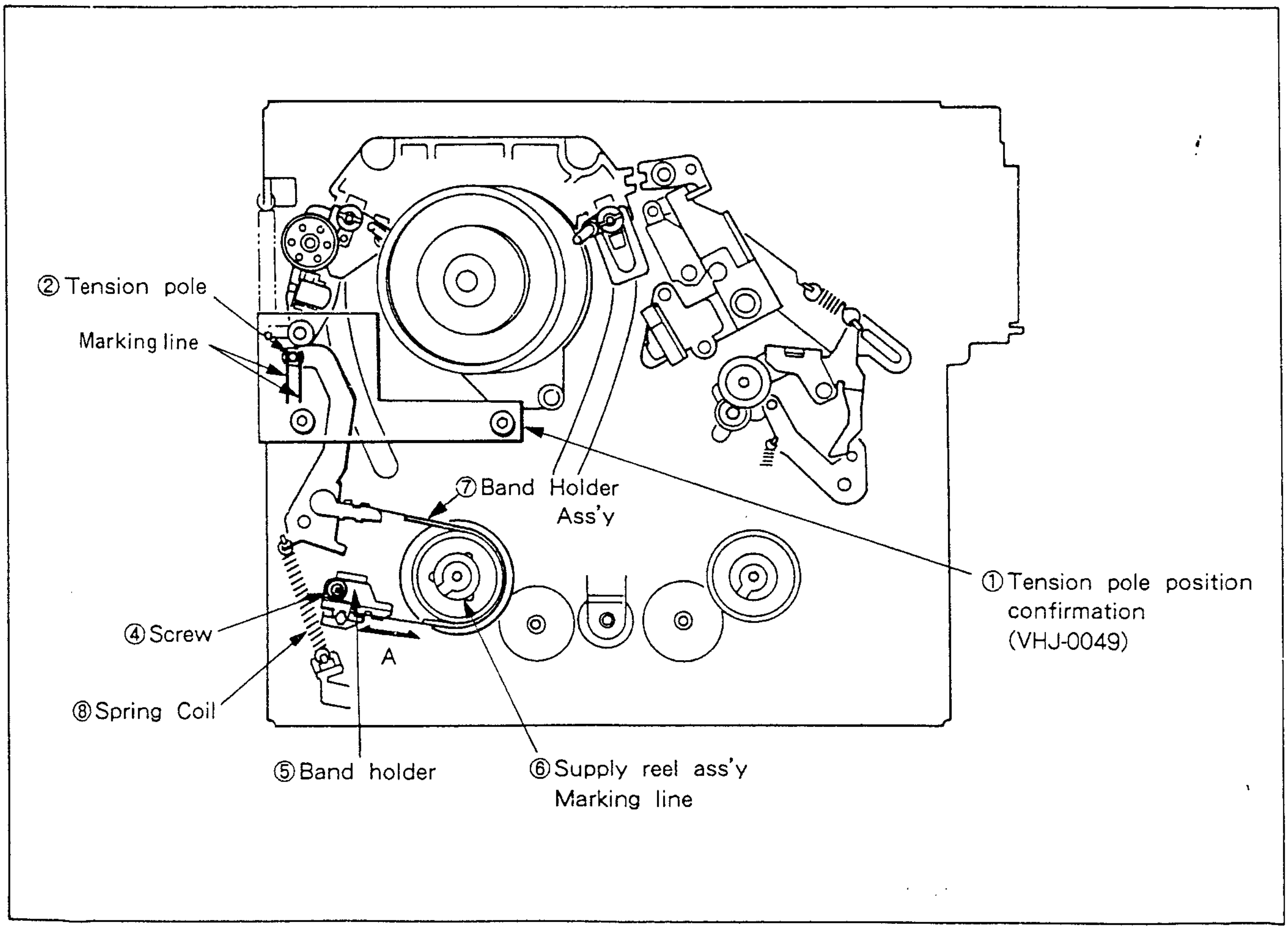


Fig. 6-3-1. Tension Pole Positioning Adjustment

6-4. TAPE PATH ADJUSTMENT

The tape path mechanism is precisely adjusted at the factory. Normally no readjustment is required, but checking and/or adjustment is necessary when parts of the tape path mechanism among those shown in the figure below (See Fig. 6-4-1.) have been removed or replaced after a long period of use. This operation consists of adjusting the various guides so that the tape drawn out from the supply reel runs smoothly along the DRUM (CYLINDER) lead surface. A way of grasping the tape path condition by electronic means is monitoring the video head output envelope waveform with an oscilloscope. However, the fact that visual observation is essential in order to know whether the tape is running through the various guides in a smooth and natural way should be kept in mind when checking and adjusting.
Also remember that the position of tape guides is not greatly affected by the replacement of the UPPER DRUM (UPPER CYLINDER) or the COMPL DRUM (COMPL CYLINDER), provided that it is correctly performed, and that only the replaced parts should be adjusted after replacing a tape guide or COMPL HEAD BRACKET, since the position of the other tape guides shall not change considerably.

6-4-1. Preparations for Adjustment

(1) Clean the tape transport surfaces (See Fig. 6-4-1.).

(2) Connect the oscilloscope. Connect the channel 1 probe to the envelope waveform test point, and the channel 2 probe to the SW30 (RF SW P) test point. During adjustment, apply a trigger to the low side of the SW30 (RF SW P) in order to monitor the waveform output from channel 1 of the video head.

Note : Since oscilloscope connection points differ according to the model, refer to the "Test Point for Tape Path Adjustment" allocation figure in the electric circuit adjustment section of the service manual book.

(3) Use a dentist's mirror for visual observation of tape path condition.

(4) Use a nut box (VHJ-0048) for adjustment of the fixed guides.

(5) Use an eccentric driver (VHJ - 0003) for adjustment of the guide rollers.

(6) When adjusting height of the fixed guide, guide rollers or COMPL head bracket, turn the special nut or the upper flange clockwise to push the tape downward, and counterclockwise to make the tape rise up.

(7) Do not use the damaged cassette tapes for tape path adjustment.

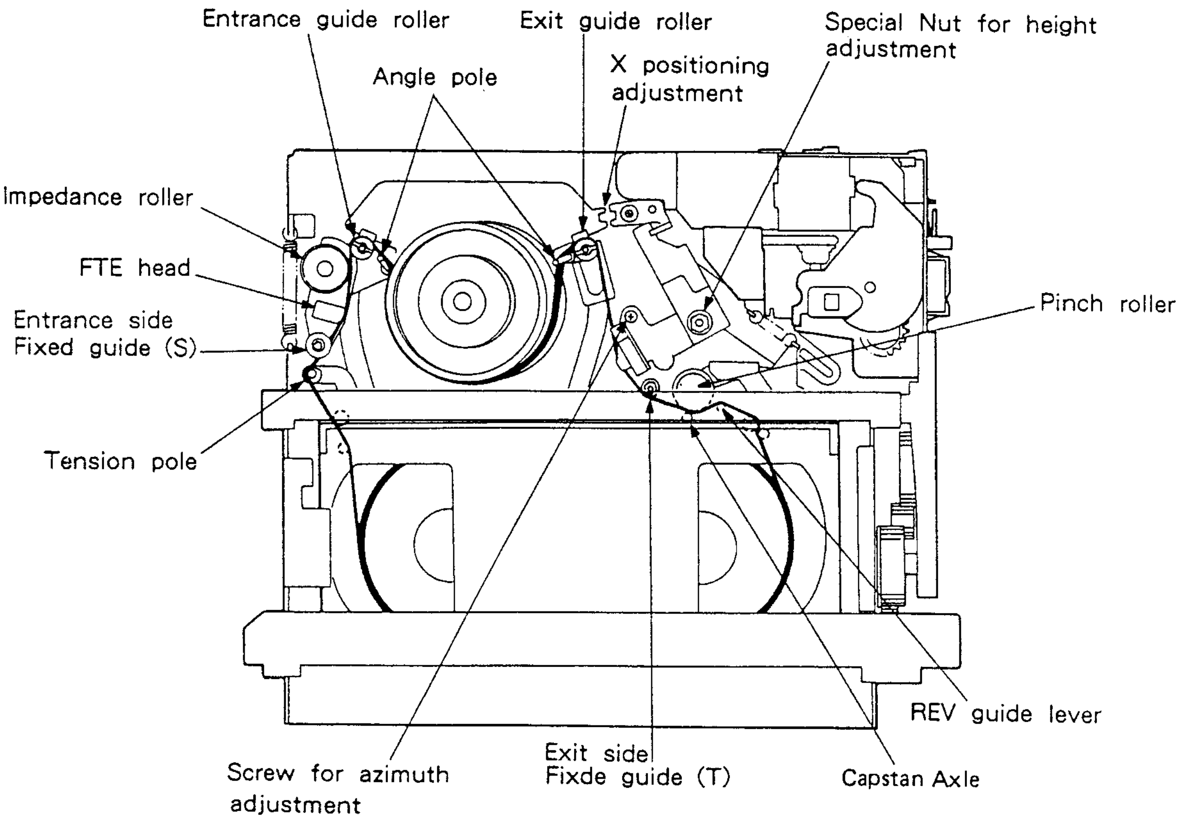

Entrance guide roller
Exit guide roller
Special Nut for height adjustment
Angle pole
X positioning adjustment
Impedance roller
FTE head
Entrance side Fixed guide (S)
Pinch roller
Tension pole
REV guide lever
Screw for azimuth adjustment
Exit side Fixde guide (T)
Capstan Axle

Fig. 6-4-1. Preparation for Adjustment

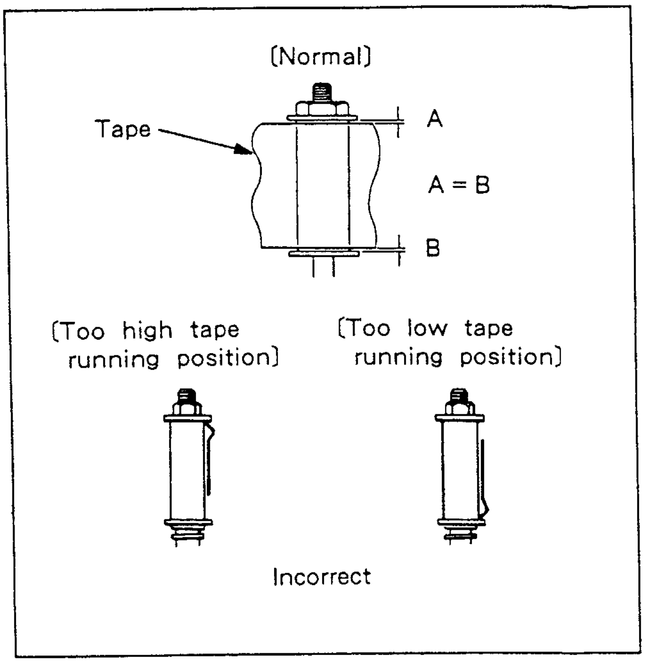
6-4-2. Adjustment by Visual Observation after Guide Roller, Fixed Guide or COMPL Head Bracket Replacement

Perform this adjustment after removing or replacing any of the above parts. Only for the replaced or removed parts, play back an alignment tape (VHJ-0009) beforehand and adjust height by visual observation.

(1) Exit Side Fixed Guide (See Fig. 6-4-2.)
Adjust so that the tape upper edge does not make contact with the fixed guide upper flange, and the tape lower edge does not make contact with the fixed guide lower flange. Gaps A and B should remain equal.

(2) Guide Rollers (See Fig. 6-4-3.)
The tape should not be curled by the guide roller upper and lower flanges. It should also run smoothly, without moving up and down on the DRUM (CYLINDER) lead surface.

Note : An excessive guide roller pressure may cause tape damage.


[Normal]
Tape
A
A = B
B
[Too high tape running position]
[Too low tape running position]
Incorrect

6-4-2. (1) Pre-set For Exit Side Fixed Guide

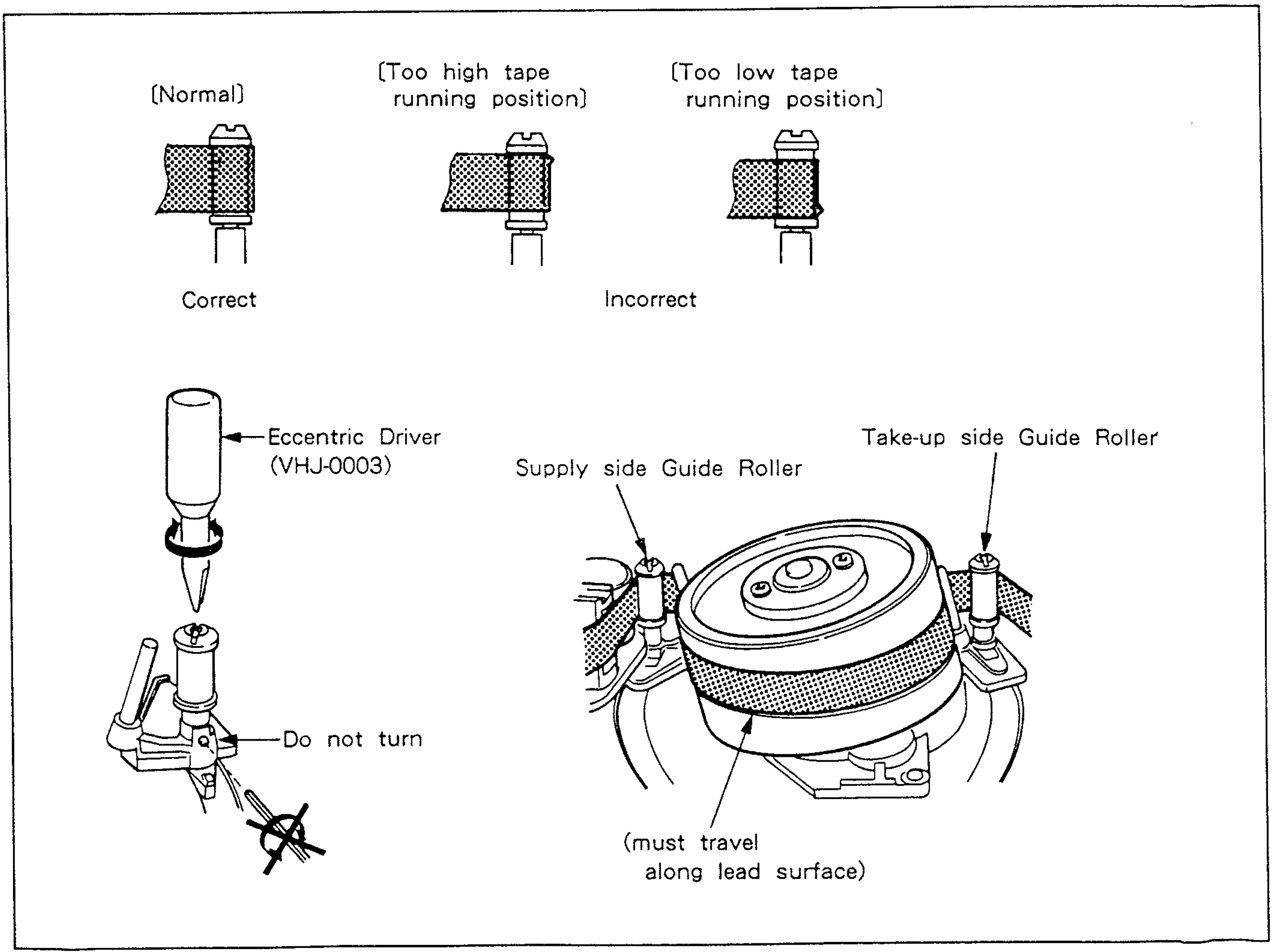

[Normal]
[Too high tape running position]
[Too low tape running position]
Correct
Incorrect
Eccentric Driver (VHJ-0003)
Do not turn
Supply side Guide Roller
Take-up side Guide Roller
(must travel along lead surface)

Fig. 6-4-3. (2) Pre-set for Guide Roller

(3) COMPL Head Bracket (ACE Head) (See Fig. 6-4-4.)
Adjust the special nut so that the tape edge runs between the audio head upper end and the control head lower end. Gaps A and B should be of about the same width. Since at this point it is only required that the control signal is picked up and the servo circuit works normally, no adjusting screws except the COMPL head bracket special nut should be touched.

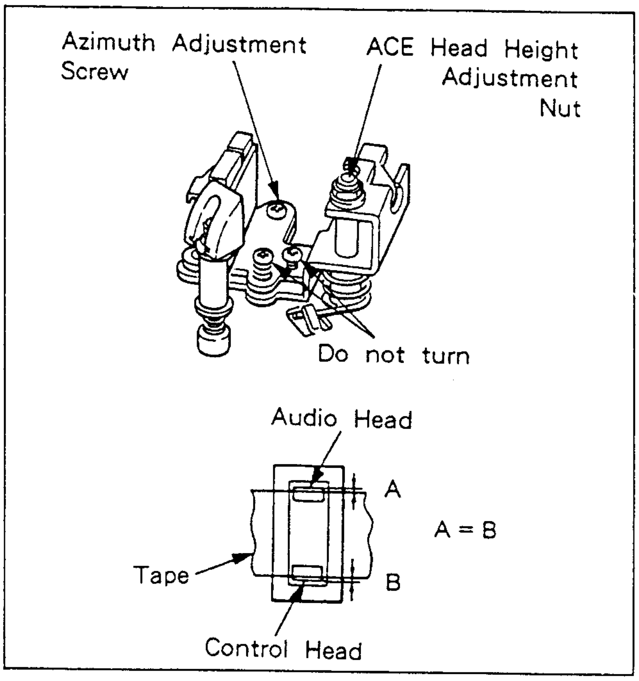

Azimuth Adjustment Screw
ACE Head Height Adjustment Nut
Do not turn
Audio Head
A
A = B
Tape
B
Control Head

Fig. 6-4-4. (3) Pre-set for Compl Head Bracket

6-4-3. Entrance Side Fixed Guide (S) Height Adjustment (See Fig. 6-4-5.)

The P90 mechanism entrance side fixed guide comes in two types ; the one in this unit is equipped with an upper flange and a spring coil, and it requires height adjustment. The other type is not provided with an upper flange and a spring coil. Height is naturally set when the special nut is fastened, so adjustment is not required.

For units with an upper flange, perform height adjustment as explained below. Even for types which do not require height adjustment, check whether the lower tape edge runs along the lower flange. Be careful not to fasten the special nut excessively, causing the axle to run idle.

1) Rotate the fixed guide (S) counterclockwise to lift the tape somewhat, then insert the fixed guide height gage (VHJ-0053) into the lower side of the fixed guide (S) lower flange.
2) Rotate the fixed guide (S) special nut clockwise a little at a time until the lower flange makes contact with the upper surface of the fixed guide height gage, causing a slight drag.
3) After rotating the special nut 90° counterclockwise, remove the Axed guide height gauge.
4) After adjusting the guide rollers in section 5-4-4, play back the alignment tape (VHJ-0009). Confirm that the tape lower edge runs in close contact with the fixed guide (S) lower flange. In case too much pressure has left a gap between the tape and the lower flange, or excessive lifting has caused curling of the tape lower edge, perform fine adjustment. However, do not adjust the special nut beyond 90° clockwise and 45° counterclockwise.

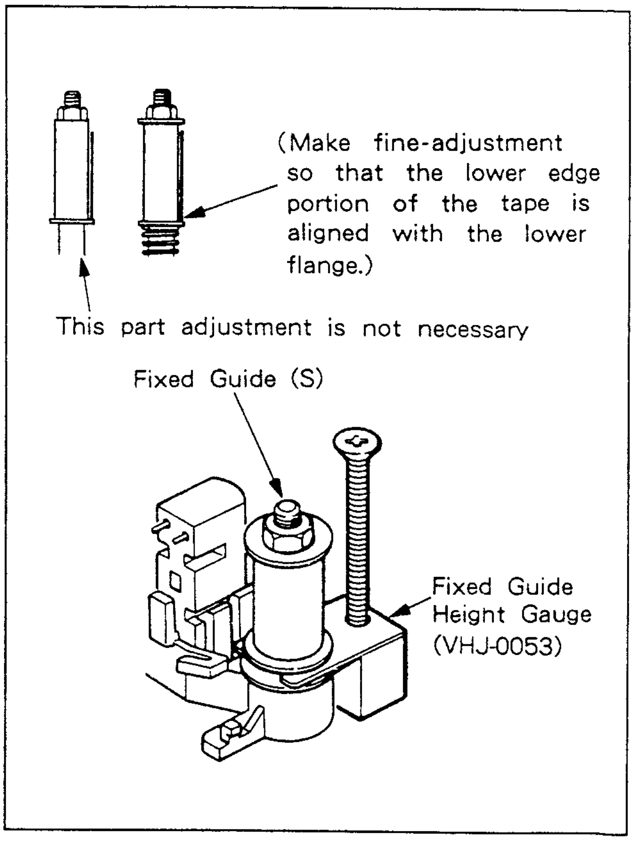

(Make fine-adjustment so that the lower edge portion of the tape is aligned with the lower flange.)
This part adjustment is not necessary
Fixed Guide (S)
Fixed Guide Height Gauge (VHJ-0053)

Fig. 6-4-5. Entrance Side Fixed Guides

6-4-4. Guide Roller Adjustment (See Fig. 6-4-6.)

1) Play back the alignment tape (VHJ-0009), press the tracking control key and adjust the envelope waveform to the maximum level.
2) Loosen the entrance and exit guide rollers by rotating them counterclockwise, then rotate them clockwise alternately until they are fastened and a flat video output waveform is obtained.
3) Confirm that the envelope waveform is not deformed, and check visually that no curling occurs at the guide roller upper and lower flanges.
4) Press the tracking control key and set the envelope waveform level to approx. 50% of the maximum. In this condition, confirm whether the envelope waveform is flat. It will not, showing valleys or peaks at the first half (entrance) or second half (exit), if the guide roller pressure is excessive or insufficient.
In case there is unevenness in the first half (entrance), adjust the entrance side guide roller. If the second half (exit) shows trouble, adjust finely the exit side guide roller.

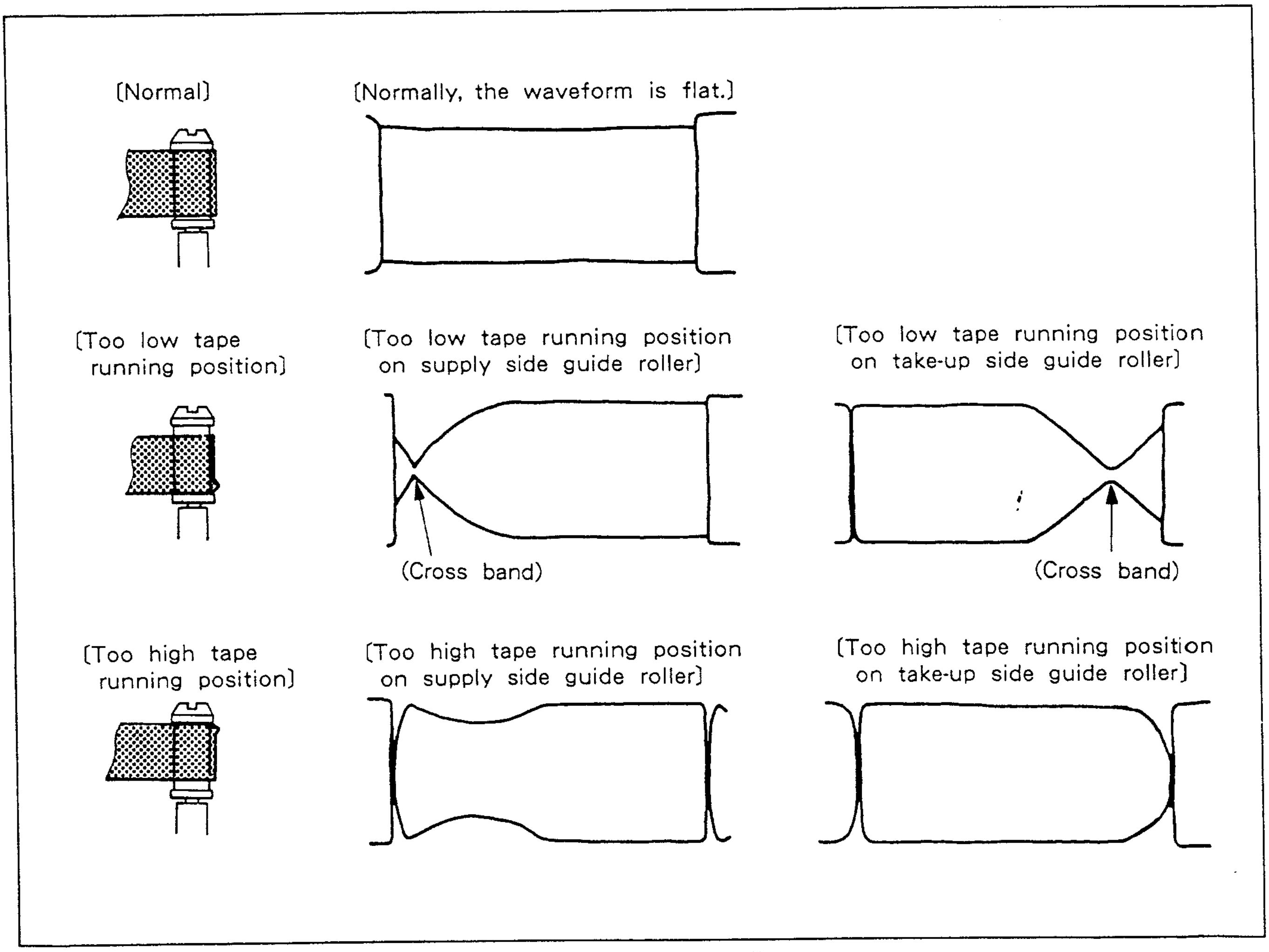

[Normal]
[Normally, the waveform is flat.]
[Too low tape running position]
[Too low tape running position on supply side guide roller]
(Cross band)
[Too low tape running position on take-up side guide roller]
(Cross band)
[Too high tape running position]
[Too high tape running position on supply side guide roller]
[Too high tape running position on take-up side guide roller]

Fig. 6-4-6. Guide Roller Adjustment

6-4-5. Exit Side Fixed Guide (T) Adjustment (See Fig. 6-4-7.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Rotate the special nut counterclockwise so that the lower flange lifts the tape until its lower edge is slightly curled.
3) Rotate the special nut clockwise a little at a time until curling of the tape lower edge is removed.
4) Confirm at each mode (PLAY, F.SEARCH, R. SEARCH, F.F and REW) that the tape runs along the lower flange and that no curling occurs.

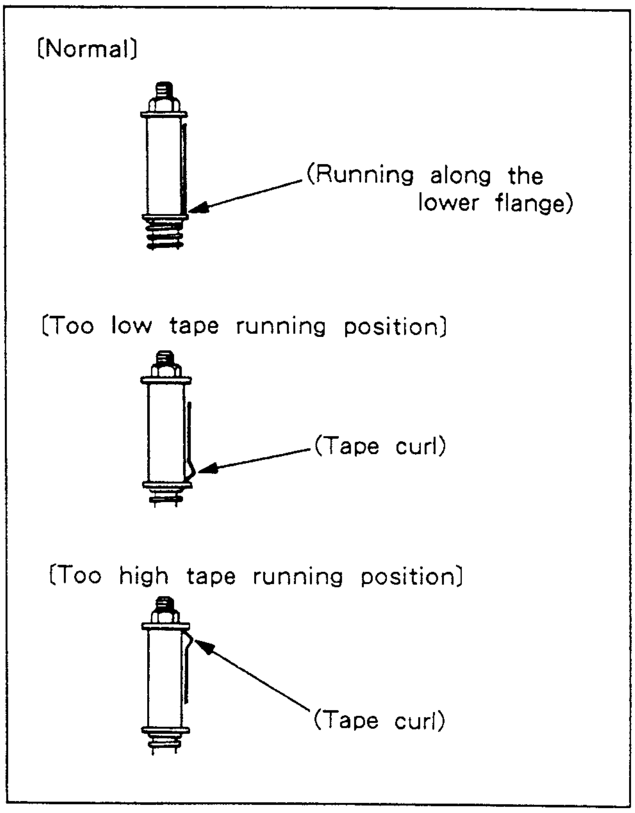

[Normal]
(Running along the lower flange)
[Too low tape running position]
(Tape curl)
[Too high tape running position]
(Tape curl)

Fig. 6-4-7. Fixed Guide (T)

6-4-6. COMPL Head Bracket (ACE Head) Adjustment

(1) Height Adjustment and Azimuth Adjustment (See Fig. 6-4-8.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Monitor the audio output waveform with the oscilloscope.
3) Rotate the azimuth adjustment screw until the audio output waveform amplitude is maximum.
4) After loosening the ACE head height adjustment special nut, rotate it slowly clockwise until amplitude of the audio output waveform is maximum, then adjust it finely clockwise to the point just before the said waveform amplitude begins to decrease.
5) Rotate the azimuth adjustment screw until amplitude of the audio output waveform is maximum.
6) Confirm that the audio output waveform amplitude does not fluctuate.

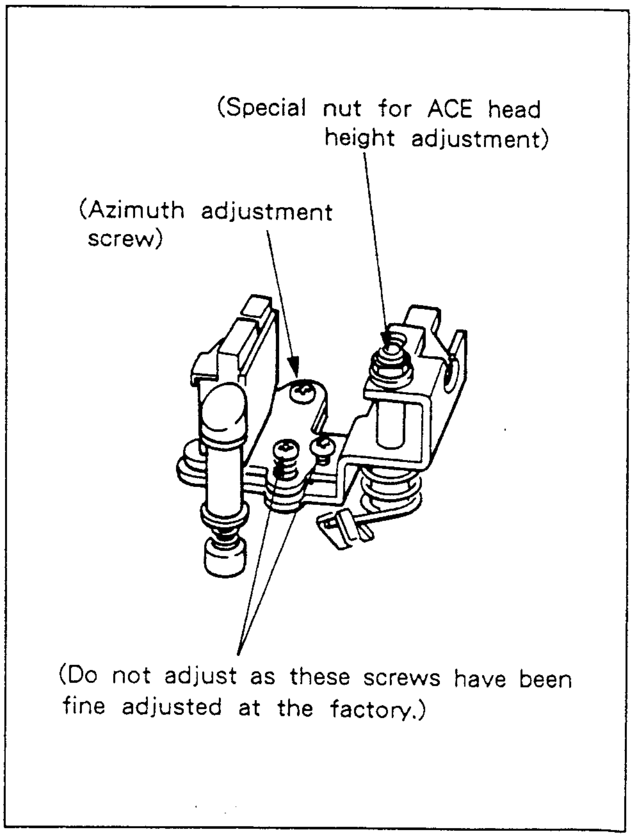

(Special nut for ACE head height adjustment)
(Azimuth adjustment screw)
(Do not adjust as these screws have been fine adjusted at the factory.)

Fig. 6-4-8. Compl Head Bracket

(2) Tracking (X Value) Adjustment (See Fig. 6-4-9.)

1) Load the alignment tape (VHJ-0009) and set the PLAY mode.
2) Set tracking to the center position with the tracking control key (See Note below).
3) Rotate the stopper bracket fixing screw 180° counterclockwise.
4) Monitor the video head output envelope waveform with the oscilloscope.
5) Adjust the stopper bracket position so that amplitude of the envelope waveform becomes maximum at the tracking center and the envelope waveform amplitude changes by the same amount when shifting the tracking center by pressing the plus (+) and minus (−) tracking control keys.
6) Tighten the fixing screw.
7) (Model for LP mode tape speed capability)
Playback the alignment tape (VHJ-0052) and set the tracking to the center using a tracking control key.
Then confirm that the playback picture on screen is normal. If not, Make readjustment by referring to items 1) through 7). To readjust, playback VHJ-0009 and finely adjust the position of the stopper bracket within the range in which the amplitude of the envelope waveform can be held to a maximum.
8) Perform servo circuit PB PHASE (Switching position) adjustment.

Note: For models equipped with auto tracking, always set to the manual tracking mode before adjustment. To confirm the tracking center position, press the tracking keys (+, −) and observe the front panel clock display. It will read "T − : −" at the tracking center, "T − : , T − − : " when keeping the minus (−) key pressed, and "T : −, T : − −" when keeping the plus (+) key pressed. The time indication will be restored 2 to 3 seconds after the tracking keys are released.

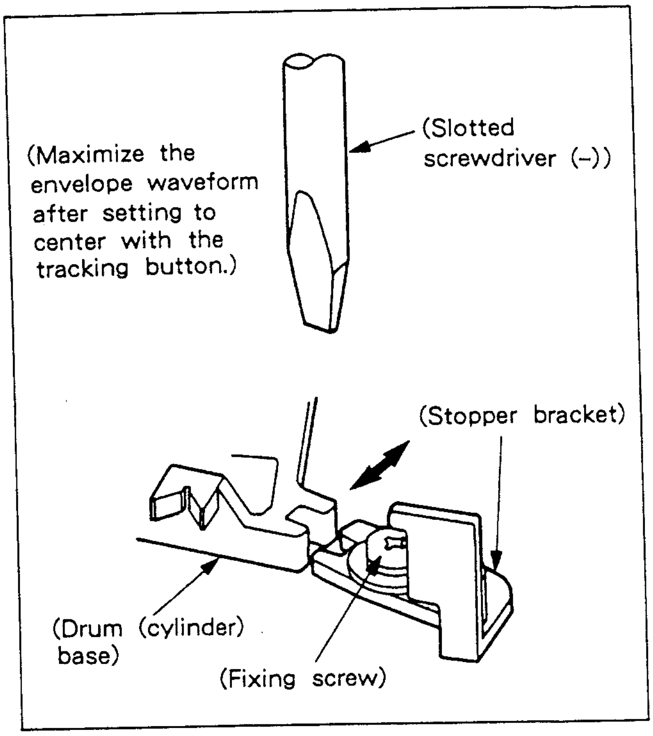

(Maximize the envelope waveform after setting to center with the tracking button.)
(Slotted screwdriver (−))
(Stopper bracket)
(Drum (cylinder) base)
(Fixing screw)

Fig. 6-4-9

6-4-7. Checking after Adjustment

Tape running may show a slight change depending upon the type of the cassette tape (thick or thin tape), the start, middle, or end of cassette tape winding, etc. After performing the tape path adjustment with use of an alignment tape, be sure to check the following points. Incidentally, the alignment tape to be used should be E-180 or E-240 cassette should be a good one without any damage to it.

(1) Try to play back the alignment tape (VHJ-0009) and confirm that the envelope waveform rise immediately and that there is no fluctuation in the envelope waveform and the audio output waveform.

(2) Load a cassette tape E-180 and start recording operation in the standard mode. 1 kHz should be fed to the audio input terminal when recording. After recording, the following points should be checked.

1. When the recorded portion is played back, the envelope waveform rise immediately, and no fluctuation in the envelope waveform is observed. Also, no speed drop occurs during the first half period or the last half period. Further, check to be sure that no fluctuation occurs in the audio waveform. Also confirm that neither the tape curling or derailing is caused on the upper or lower flange and the on the read side of the drum.
2. Confirm that no tape curling or derailing occurs in the upper or lower flange of each tape guide and the read side of the drum during each mode of operation, namely, FF, REW, F. SEARCH, and R. SEARCH.
3. Confirm that the envelope waveform rise immediately after changing the mode directly to the PLAY from each mode of FF, REW, F. SEARCH, R. SEARCH, or POWER OFF (INITIAL) and that no tape curling or derailing occurs in the upper or lower flange of the each tape guide and on the read side of the drum.

(3) Load a E-240 cassette tape and perform recording operation in the SP mode. 1 kHz should be fed to the audio input terminal when recording. Now, confirm that the envelope waveform rise immediately upon starting the playback of the recorded portion, and that neither fluctuation in the envelope waveform nor a speed drop occurs during the first half period or the last half period. Also confirm that no tape curling or derailing is caused in the upper or lower flange of each tape guide and on the drum lead surface.

(4) Perform recording for 60 seconds in the SP mode at the start of E-240 cassette winding. Play back the recorded portion and repeat the F.SEARCH ↔ R.SEARCH ten times, following which confirm that no damage is done to the tape edge. If any damage is found on the tape edge, a proper step must be taken as below depending upon the symptom obserbed.

1. When a sawtooth shaped damage is caused on underside of the tape edge by the REV guide
   1) Check to see if damage is done to the tape by the REV guide.
   2) Loosen the tilt adjustment screw of the ACE head bracket by turning it 135° counterclockwise.
   3) Make readjustment of the exit side fixing guide by referring to item 6-4-5.
   4) Make readjustment of the ACE head bracket (azimuth, height and adjustment of X value) by referring to item 6-4-6.
   5) Confirm that no fluctuation in the audio level is caused by loosening the tilt adjustment screw in steps 1) and 2) above. Move the screw a little back if any fluctuation is found (but never move it back to the original position). After adjusting the tilt adjustment screw is readjusted, perform steps 3) and 4) once again.
   6) Confirm again that the E-240 cassette tape does not sustain any damage.
   7) Perform the recording and playback on the E-180 and E-240 cassette tape and confirm that no fluctuation occurs in the envelope waveform and the audio waveform.

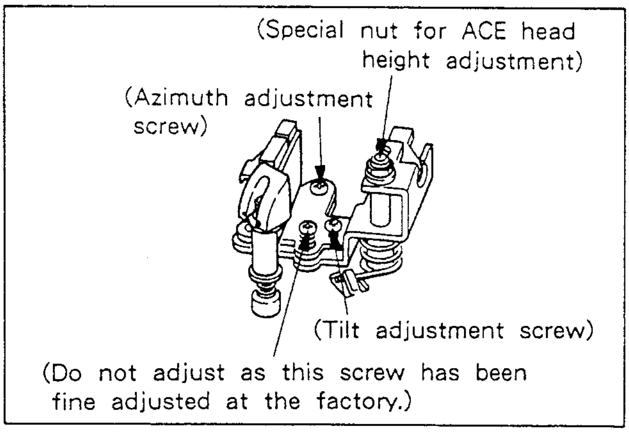

(Special nut for ACE head height adjustment)
(Azimuth adjustment screw)
(Tilt adjustment screw)
(Do not adjust as this screw has been fine adjusted at the factory.)

Fig. 6-4-10 Compl Head Bracket

2. If damage in the form of a sawtooth or a streak is found on the tape edge
   1) Check if a large amount of magnetic particles is adhered to the exit-side guide roller. If magnetic particles cannot be removed in spite of repeated cleaning, the guide roller must be replaced.
   2) Confirm if the tape is held too tightly by the exit-side guide roller, or if the last half of the envelope waveform is flat. If the type is found held too tightly, readjustment should be made by referring to 6-4-4.
   3) Recheck if the damage is still caused on the E-240 tape.
      If similar damage is still found on the tape, the exit-side guide roller should be loosened about 20° counterclockwise.
   4) Check once again that no fluctuation is caused in the envelope waveform or the audio waveform by loosening the exit-side guide roller. To do this, record and play back the E-240 cassette tape.

(5) Perform recording for 60 seconds in the SP mode at the near end of the E-240 cassette tape. Play back the recorded portion and repeat the F. SEARCH ↔ R. SEARCH ten times, following which a check should be made to see if damage is still done to the tape edge. If a damage in the form of a sawtooth or a streak is still occurred on the tape edge by the upper lounge of entrance side guide roller, proceed with the step given below.
   1) Check if a large amount of magnetic particles is adhered to the entrance-side guide roller. If the magnetic particles cannot be removed in spite of repeated cleaning, the guide roller must be replaced with new one.
   2) Confirm if the tape is held too tightly by the entrance-side guide roller, or if the first half of the envelope waveform is flat. If the tape is found held too tightly, readjustment should be made by referring to 6-4-4.
   3) Recheck if the damage is still caused on the E-240 tape.
      If the damage is still found on the tape, the entrance-sideguide roller should be loosened aboud 20° counterclockwise.
   4) Check once again that no fluctuation is caused in the envelop waveform or the audio waveform by looseving the entrance-side guide roller. To do this, record and play back the E-240 cassette tape.

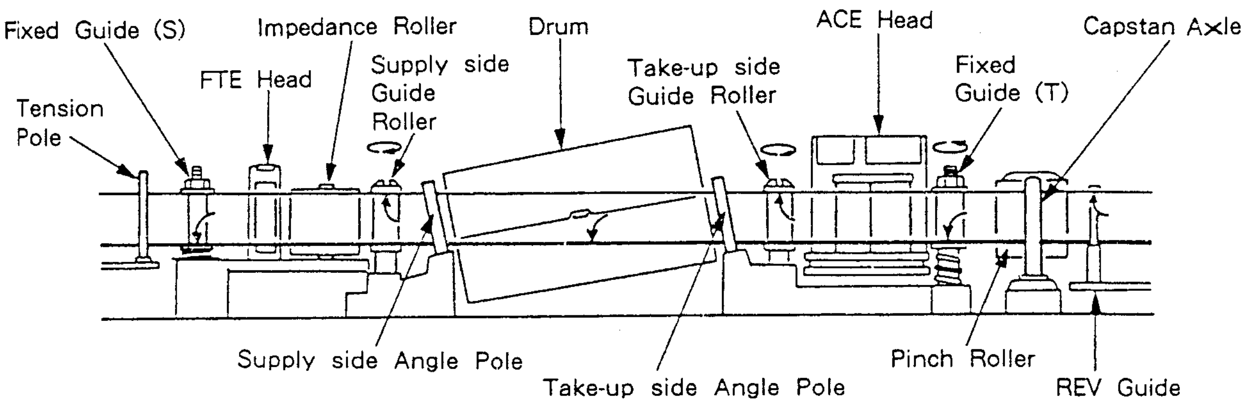


Fig. 6-4-11.

2. If damage in the form of a sawtooth or a streak is found on the tape edge
   1) Check if a large amount of magnetic particles is adhered to the exit-side guide roller. If magnetic particles cannot be removed in spite of repeated cleaning, the guide roller must be replaced.
   2) Confirm if the tape is held too tightly by the exit-side guide roller, or if the last half of the envelope waveform is flat. If the type is found held too tightly, readjustment should be made by referring to 6-4-4.
   3) Recheck if the damage is still caused on the E-240 tape.
      If similar damage is still found on the tape, the exit-side guide roller should be loosened about 20° counterclockwise.
   4) Check once again that no fluctuation is caused in the envelope waveform or the audio waveform by loosening the exit-side guide roller. To do this, record and play back the E-240 cassette tape.

(5) Perform recording for 60 seconds in the SP mode at the near end of the E-240 cassette tape. Play back the recorded portion and repeat the F. SEARCH ↔ R. SEARCH ten times, following which a check should be made to see if damage is still done to the tape edge. If a damage in the form of a sawtooth or a streak is still occurred on the tape edge by the upper lounge of entrance side guide roller, proceed with the step given below.
   1) Check if a large amount of magnetic particles is adhered to the entrance-side guide roller. If the magnetic particles cannot be removed in spite of repeated cleaning, the guide roller must be replaced with new one.
   2) Confirm if the tape is held too tightly by the entrance-side guide roller, or if the first half of the envelope waveform is flat. If the tape is found held too tightly, readjustment should be made by referring to 6-4-4.
   3) Recheck if the damage is still caused on the E-240 tape.
      If the damage is still found on the tape, the entrance-sideguide roller should be loosened aboud 20° counterclockwise.
   4) Check once again that no fluctuation is caused in the envelop waveform or the audio waveform by looseving the entrance-side guide roller. To do this, record and play back the E-240 cassette tape.

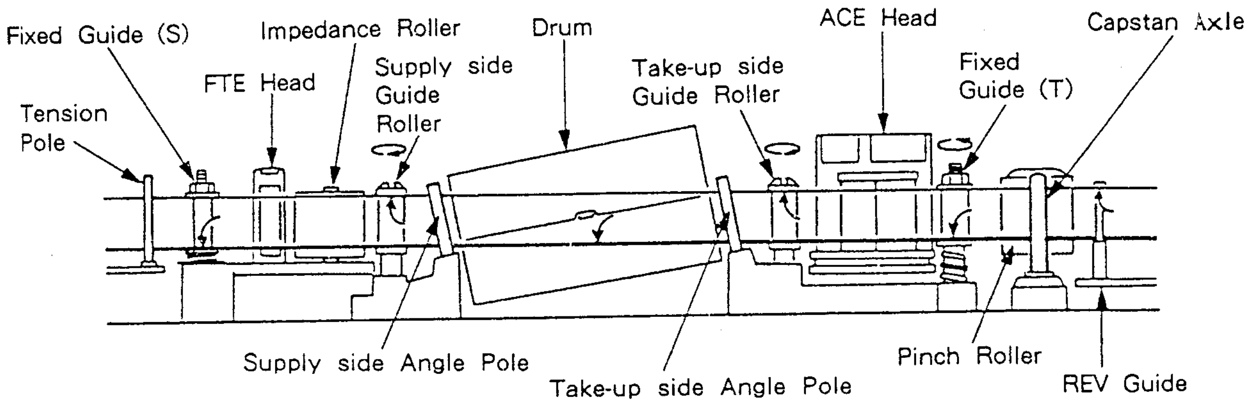


Fig. 6-4-11.

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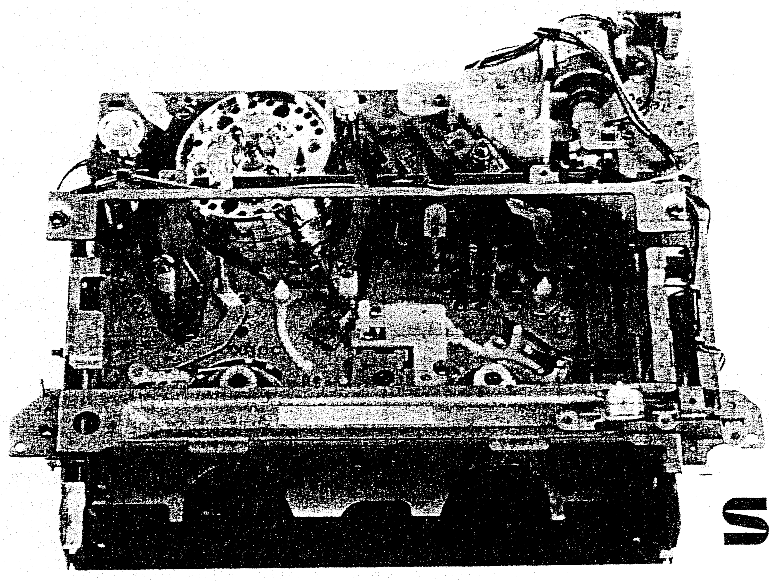
Supplement
Service Technical
Information

Colour Video
Cassette Recorder

P-90 S VHS Mechanism



S VHS 625 VHS PAL

Use this supplement together with the P-90 Mechanism Manual (WM-530599) of the Service Technical Information published in 1990.

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1. OUTLINE OF P-90 S VHS MECHANISM

The reel drive system of P-90 S VHS mechanism has been newly developed based upon the P-90 mechanism. As for the mechanism composition other than reel drive system is the same as P-90 mechanism. Since only the different sections from P-90 mechanism are described in this manual, use the P-90 Mechanism Manual (Mechanism Service Technical Information) published in 1990 as well. P-90 S VHS is featured as follows;

1) Brass impedance rollers of large diameter at head drum entrance and small diameter at exit are employed in order to reduce jitter component of tape path system and to obtain the stable picture.

2) The mode transition time as shown in Fig. 1-1 is reduced, comparing with P-90 mechanism. The tape rewind time is largely reduced by FF/REW high-speed. Therefore, the following points are taken into consideration in P-90 S VHS.

	P-90 MECHANISM	P-90 S VHS MECHANISM
STOP → PLAY	1.5"	1.3"
CASSETTE IN	4.9"	4.4"
POWER OFF → PLAY	4.1"	3.6"
FF/REW REWIND TIME (E-180)	4'	2'40"

Table 1-1. Mode Transition Time Comparison

① Noise reduction by large driven gear
In order to reduce the noise of reel drive system in FF/REW modes, the large driven gear is employed so that proper contact ratio is obtained. A driving force between gears can be smoothly transmitted by using large gear, therefore the noise at gear engagement can be reduced.

② Change of deceleration ratio in FF/REW modes
In order to reduce the capstan motor noise, the reel pulley diameter has been changed and drive deceleration ratio is reduced as possible.

③ Brake mechanism improvement
During taking-up the tape at high-speed in FF/REW modes, if sudden brake is applied, a high tape tension is generated and the tape will be damaged by rotary head, etc. Therefore, the brake mechanism components have been improved to apply brake softly, so that the brake operation is stabilized.

④ Capstan motor control
In order to operate FF and REW modes in higher-speed, a capstan motor used as a reel driving source is newly developed to upgrade the revolutions. However, only by upgrading the revolutions, VISS signal dropout, etc. caused by tape defects and slacks can not be prevented.
And when the tape is rewound in high-speed even at the end of tape rewinding, the leader tape portion is also rewound before the tape end sensor detects and the brake is applied, thus the tape will be damaged.
In order to prevent this, the capstan motor is designed to start smoothly at the start of FF/REW modes. And the tape remaining amount detector is used to detect the specified amount (E-60:2 mm, E-180:3.6 mm) at high-speed rewind, and as soon as it reaches the specified amount, the capstan motor deceleration starts. Also in decelerating mode, a smooth deceleration is performed not to cause any tape slacks. (Refer to 1-1.)

⑤ In order to prevent the noise caused by operating at high-speed in FF/REW modes, the guide roller at drum entrance is renewed .

3) A detection switch to enable automatic discrimination of S VHS cassette tape is added.
(Same type as conventional S VHS model)

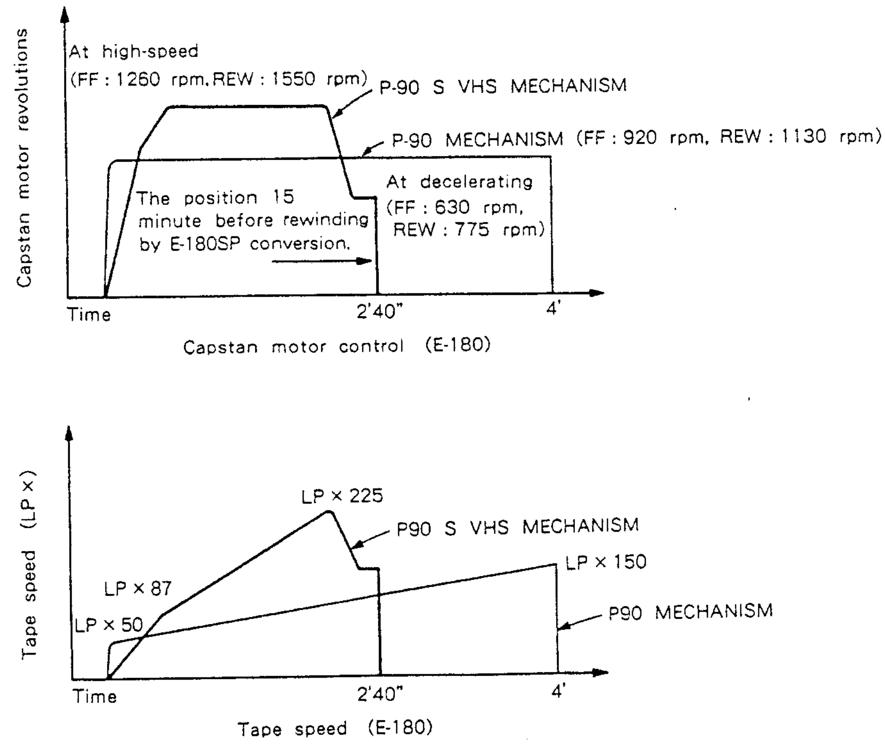


Fig. 1-1. **Comparison of Conventional Mechanism and P-90 S VHS Mechanism**

2. SECTIONS CHANGED FROM P90 MECHANISM ISSUED IN 1990

2-2. DESCRIPTION OF MECHANISM DRIVE

The shaded sections are different from P-90 MECHANISM.

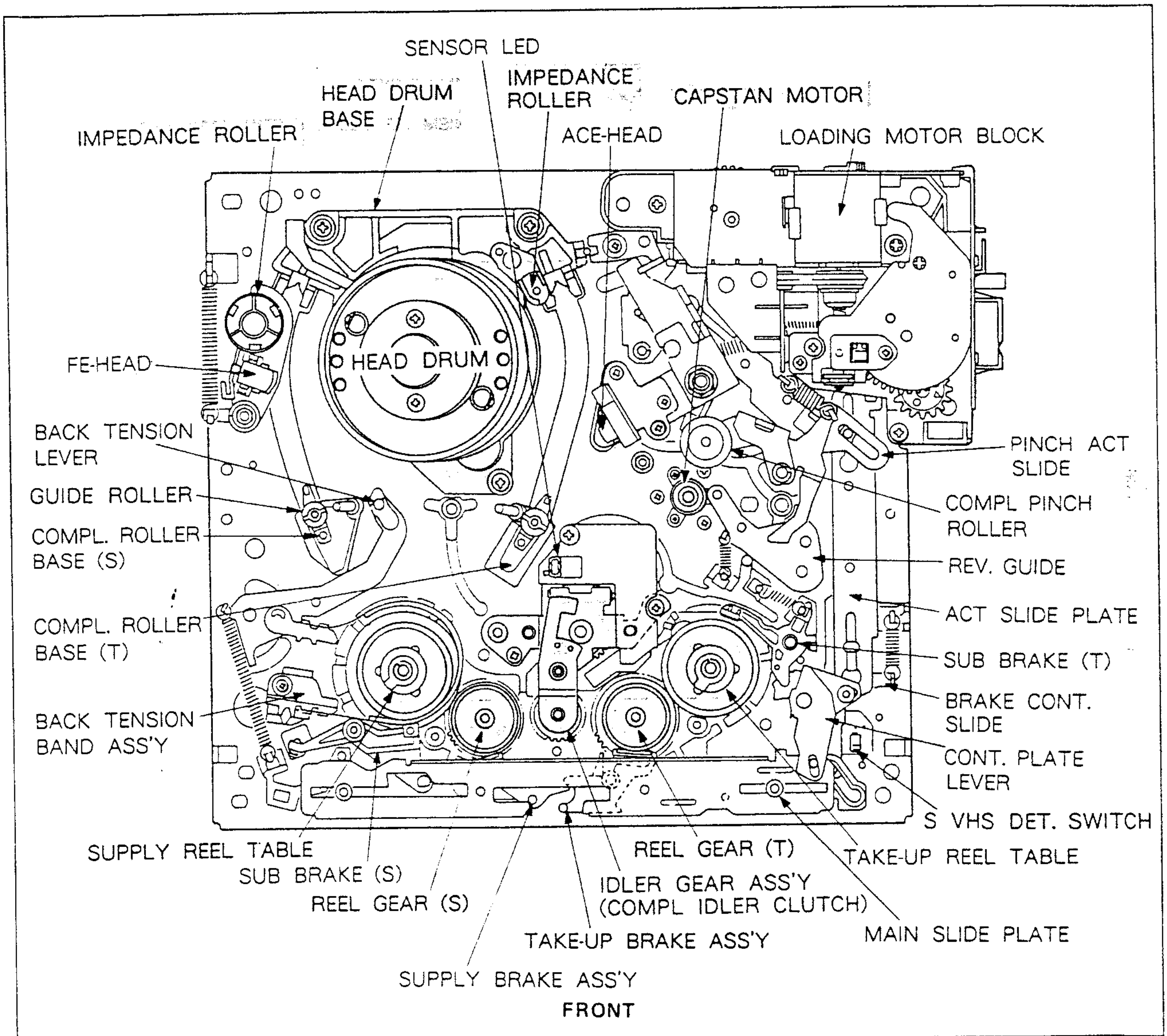

SENSOR LED
HEAD DRUM BASE
IMPEDANCE ROLLER
IMPEDANCE ROLLER
CAPSTAN MOTOR
ACE-HEAD
LOADING MOTOR BLOCK
FE-HEAD
HEAD DRUM
BACK TENSION LEVER
GUIDE ROLLER
COMPL. ROLLER BASE (S)
COMPL. ROLLER BASE (T)
BACK TENSION BAND ASS'Y
PINCH ACT SLIDE
COMPL PINCH ROLLER
REV. GUIDE
ACT SLIDE PLATE
SUB BRAKE (T)
BRAKE CONT. SLIDE
CONT. PLATE LEVER
S VHS DET. SWITCH
TAKE-UP REEL TABLE
MAIN SLIDE PLATE
SUPPLY REEL TABLE
SUB BRAKE (S)
REEL GEAR (S)
REEL GEAR (T)
IDLER GEAR ASS'Y (COMPL IDLER CLUTCH)
TAKE-UP BRAKE ASS'Y
SUPPLY BRAKE ASS'Y
FRONT

Fig. 2-1. TOP VIEW OF MECHANISM (INITIAL MODE)

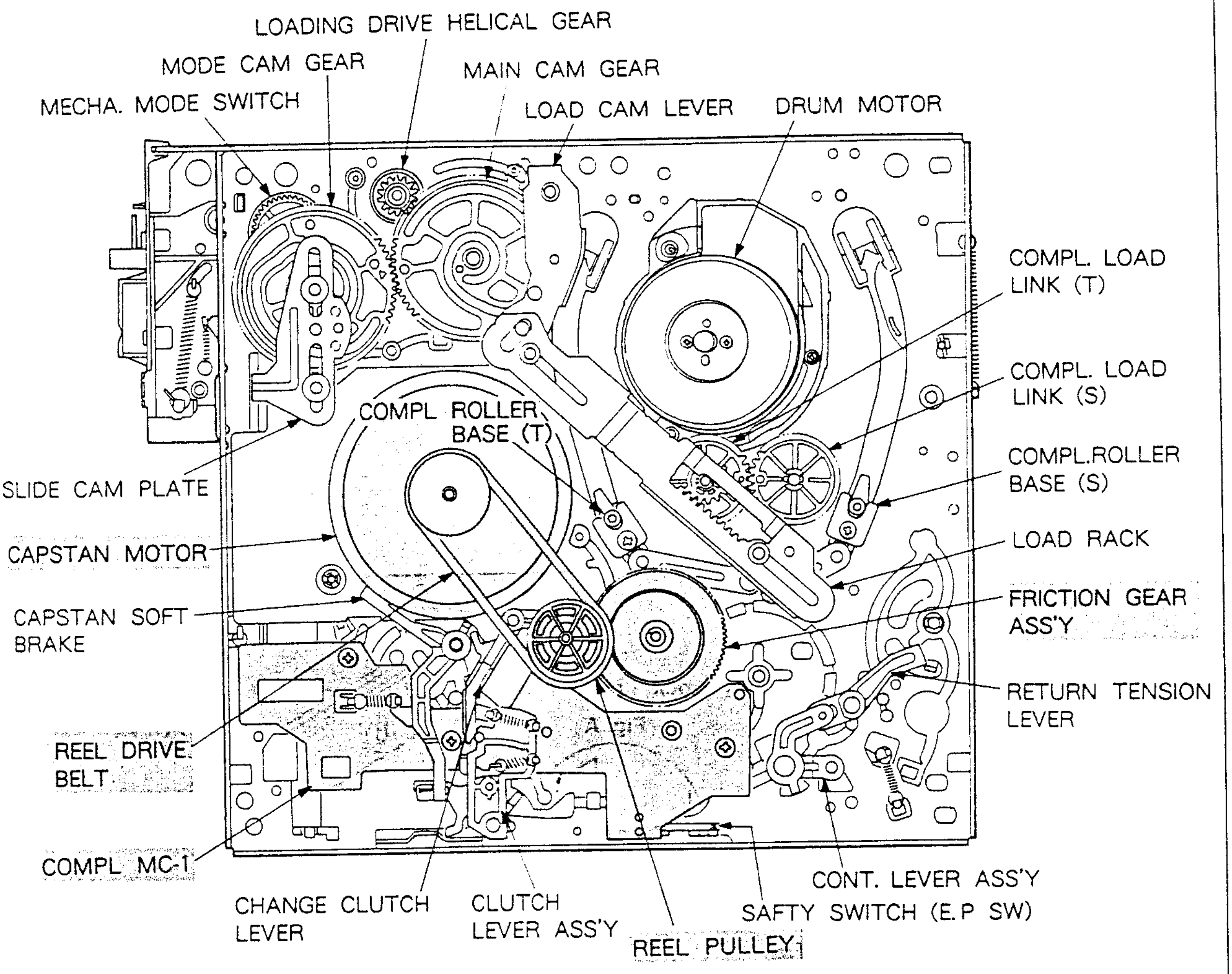

LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MAIN CAM GEAR
MECHA. MODE SWITCH
LOAD CAM LEVER
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
COMPL ROLLER BASE (T)
COMPL.ROLLER BASE (S)
SLIDE CAM PLATE
CAPSTAN MOTOR
LOAD RACK
FRICTION GEAR ASS'Y
CAPSTAN SOFT BRAKE
RETURN TENSION LEVER
REEL DRIVE BELT
COMPL MC-1
CONT. LEVER ASS'Y
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
SAFTY SWITCH (E.P SW)
REEL PULLEY
FRONT

Fig. 2-2. BOTTOM VIEW OF MECHANISM (INITIAL MODE)

5-1. MECHANISM MAIN UNIT (See Fig. 5-1-1.)

1. Removal

1) Remove the connectors of the COMPL MC-3 and the COMPL HEAD BRACKET.
2) Remove the flexible cable ① connecting the COMPL CYLINDER to the PRE-AMP UNIT ③ (See Fig. A).
3) Remove the two screws ② , then remove the PRE-AMP UNIT ③.
4) Remove the screw ④ , then remove the PRE-AMP. BRACKET ⑤.
5) Remove the two screws ⑥.
6) Remove the screw ⑦, two screws ⑪ and two screws ⑩.
   Then lift up the mechanism main unit and remove it.
   Since the TRAY ⑧ obstructs removal of the two front screws ⑩ , move the TRAY LOCK LEVER ⑨ in the direction of the arrow to unlock, then slide the TRAY ⑧ before removing the screws. (See Fig. B)

Note: Shape of the PRE-AMP UNIT ③ and the PRE-AMP. BRACKET ⑤ differ depending on the model.

2. Remounting

1) Mount the mechanism main unit onto the chassis with the screw ⑦, two screws ⑪ and two screws ⑩.
2) Tighten the two screws ⑥.
3) Mount the PRE-AMP. BRACKET ⑤ with the two screws ④.
4) Mount the PRE-AMP UNIT ③ and the ground lug with the two screws ② (some models are not provided with a ground lug).
5) Insert the flexible cable ① into the connector of the PRE-AMP UNIT.
6) Connect the connectors of COMPL MC-3 and COMPL HEAD BRACKET.

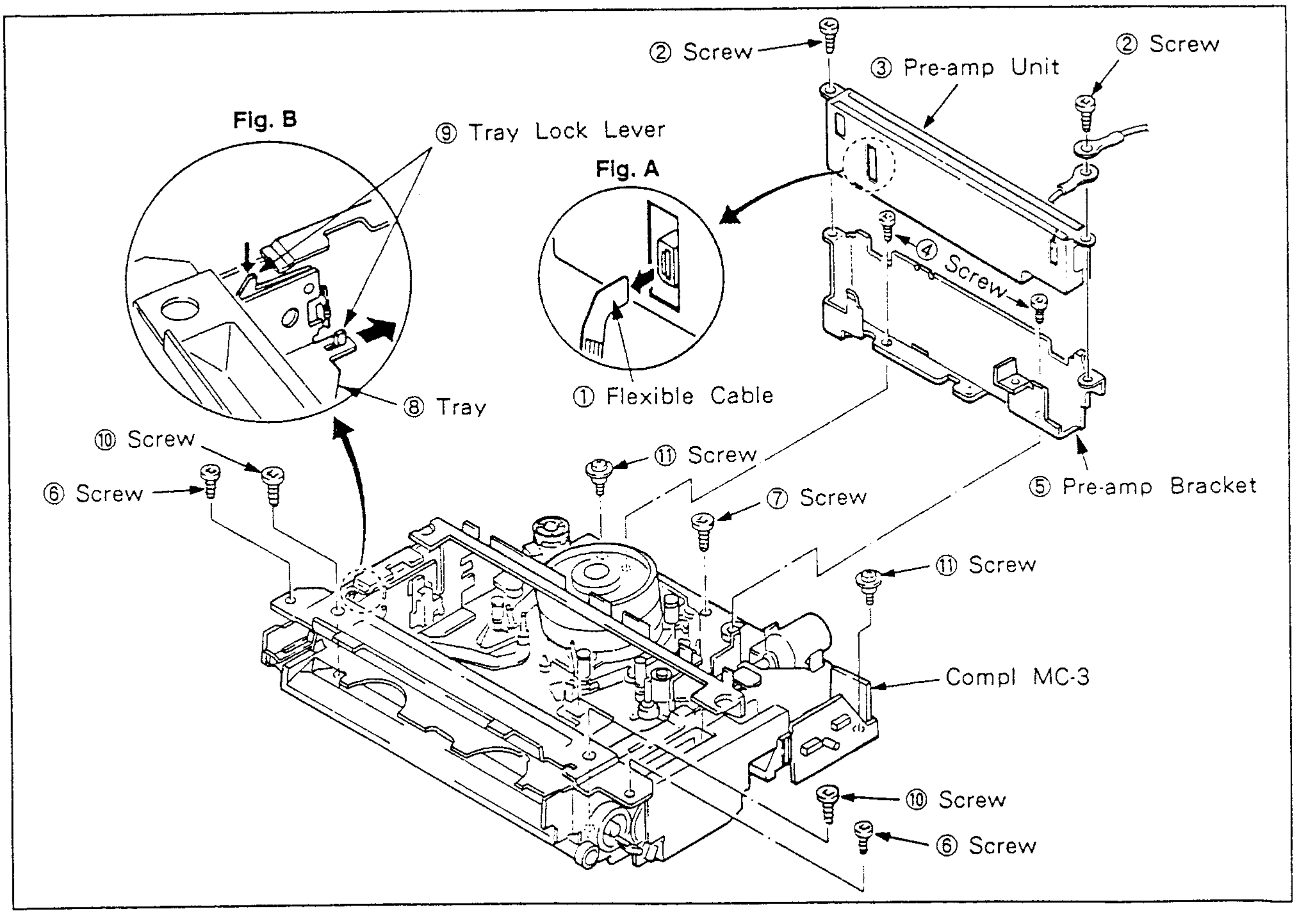

② Screw
③ Pre-amp Unit
② Screw
Fig. B
⑨ Tray Lock Lever
Fig. A
④ Screw
⑧ Tray
① Flexible Cable
⑩ Screw
⑥ Screw
⑪ Screw
⑦ Screw
⑤ Pre-amp Bracket
⑪ Screw
Compl MC-3
⑩ Screw
⑥ Screw

Fig. 5-1-1. Mechanism Main Unit

5-2. CASSETTE HOLDER MECHANISM

5-2-1. COMPL Cassette Mechanism (See Fig. 5-2-1.)

1. Removal

1) Set the video main unit to the EJECT completed mode.
2) Pull out the connectors (6-PIN CONNECTOR connected to the system control circuit board, ACE HEAD CONNECTOR, and FTE HEAD CONNECTOR) from CASSETTE HOLDER.
3) Remove the two screws ①.
4) Remove the two screws ②.
5) Lift up the COMPL CASSETTE MECHANISM ④ back a little and remove the two hooks ③ on the front (See Fig. B). When doing so, make sure that the SAFETY SWITCH LEVER is not caught by the mechanism chassis.

2. Remounting

1) Set the chassis section mechanism to the EJECT mode with the mode selector (VHJ-0050) (looking from above, match the front loading gear hole ⑤ with the MOTOR HOLDER hole ⑥ as shown in Fig. A).
2) Set the COMPL CASSETTE MECHANISM ④ to the EJECT completed mode.
3) Mount the COMPL CASSETTE MECHANISM ④ onto the mechanism chassis, aligning it with the protuberance.
   Match positions of the FRONT LOADING GEAR △ mark ⑦ and the RACK EJECT mark ⑧.
   (See Fig. A.)
4) Fix to the mechanism chassis with the two screws ②.
5) Fix to the chassis with the screw ①.
6) Connect to the various connectors.

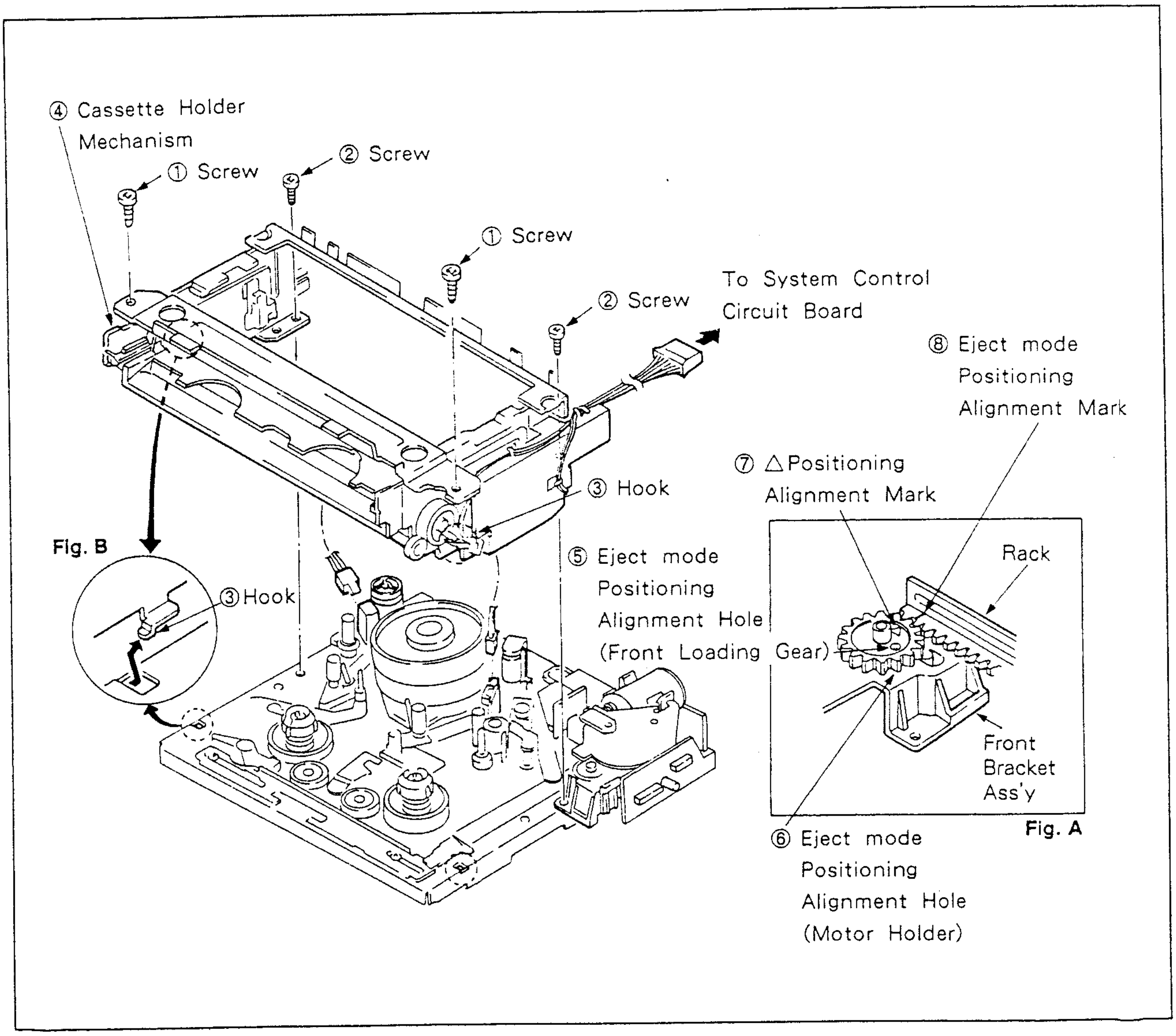

④ Cassette Holder Mechanism
① Screw
② Screw
① Screw
② Screw
To System Control Circuit Board
⑧ Eject mode Positioning Alignment Mark
⑦ △Positioning Alignment Mark
③ Hook
Fig. B
③Hook
⑤ Eject mode Positioning Alignment Hole (Front Loading Gear)
Rack
Front Bracket Ass'y
Fig. A
⑥ Eject mode Positioning Alignment Hole (Motor Holder)

Fig. 5-2-1. **Compl Cassette Mechanism**

5-2-3. Cassette Drive Gear (Right) (See Fig. 5-2-3.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM and the GEAR BRACKET ASS'Y as instructed in 5-2-1. and 5-2-2., respectively.
2) Remove the IDLER GEAR ①.
3) Remove the SPRING COIL ②, then remove the MAIN GEAR ③.
4) Remove the E ring ④, then remove the LEVER GEAR ASS'Y R ⑤.
5) Open the hook ⑥ and remove the COUPLE GEAR R ⑦. Take care not to open the hook ⑥ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the IDLER GEAR R ⑧.

2. Remounting

1) Apply grease to gear parts that undergo friction.
2) Mount the IDLER GEAR R ⑧ onto the axle ⑨.
3) Mount the COUPLE GEAR R ⑦ onto the ROD ASS'Y axle ⑩. When doing so, match the couple gear position with the IDLER GEAR R ⑧ as shown in Fig. A.
4) Mount the LEVER GEAR ASS'Y R ⑤ onto the axles ⑪ and ⑫. Match position to the IDLER GEAR R ⑧ as shown in Fig. A.
5) Mount the E ring ④ onto the axle ⑫.
6) Mount the MAIN GEAR ③ onto the axle ⑪. When doing so, match position to the IDLER GEAR R ⑧ as shown in Fig. A.
7) Hook the SPRING COIL ② to the notch ⑬ in the MAIN GEAR R ③ and the LEVER GEAR ASS'Y R.
8) Mount the IDLER GEAR ① onto the axle ⑭. When doing so, match position to the MAIN GEAR as shown in Fig. A.
9) Mount the GEAR BRACKET ASS'Y and the COMPL CASSETTE MECHANISM ASS'Y as instructed in 5-2-2. and 5-2-1., respectively.

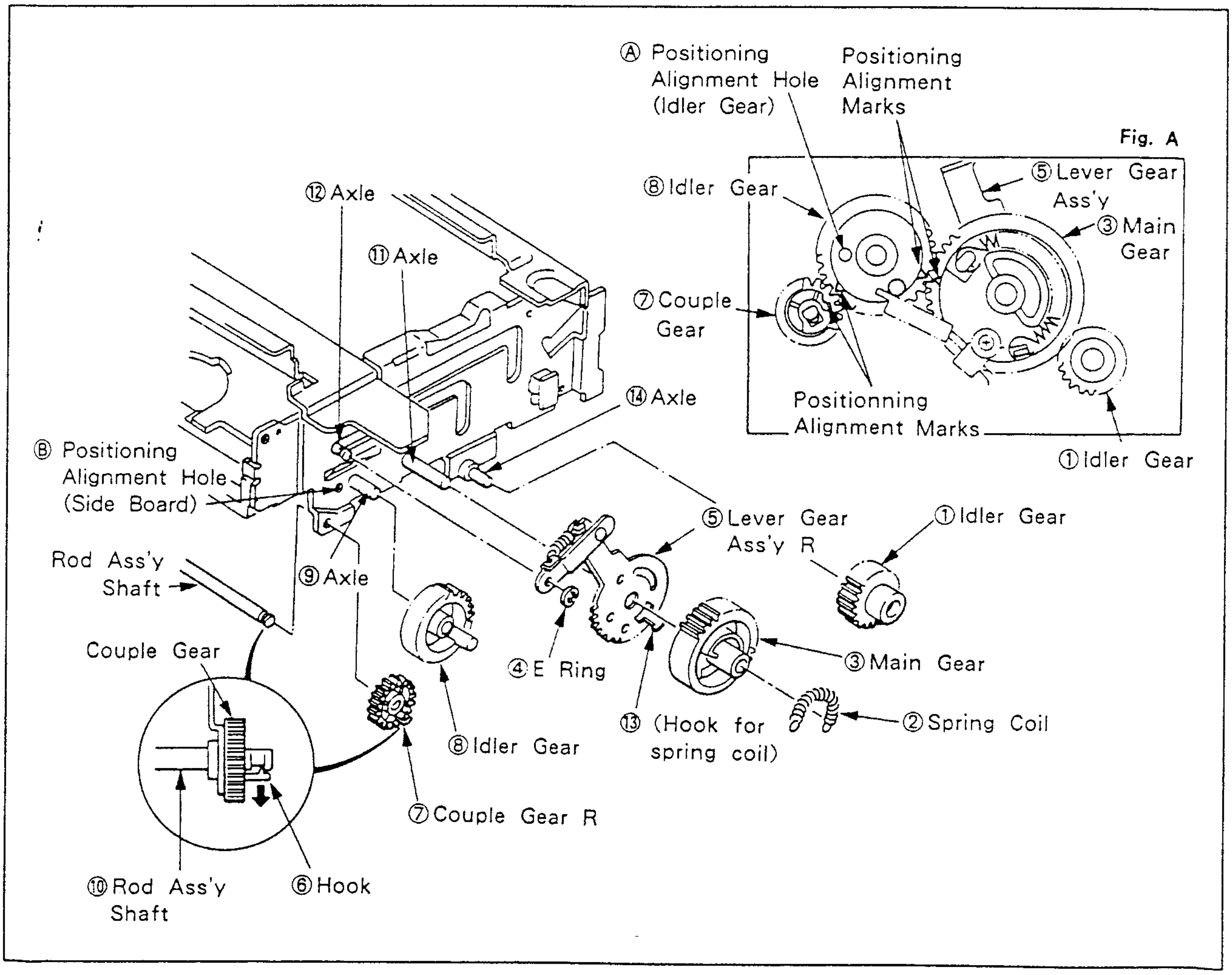

Ⓐ Positioning Alignment Hole (Idler Gear)
Positioning Alignment Marks
Fig. A
⑧ Idler Gear
⑤ Lever Gear Ass'y
③ Main Gear
⑦ Couple Gear
Positionning Alignment Marks
① Idler Gear
⑫ Axle
⑪ Axle
⑭ Axle
Ⓑ Positioning Alignment Hole (Side Board)
Rod Ass'y Shaft
⑨ Axle
Couple Gear
⑤ Lever Gear Ass'y R
① Idler Gear
④ E Ring
③ Main Gear
⑬ (Hook for spring coil)
② Spring Coil
⑧ Idler Gear
⑦ Couple Gear R
⑩ Rod Ass'y Shaft
⑥ Hook

Fig. 5-2-3. Cassette Drive Gears (Right Side)

5-2-4. Cassette Drive Gear (Left) (See Fig. 5-2-4)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COUPLE GEAR R as instructed in 5-2-3.
3) Remove the ROD ASS'Y ①.
4) Remove the E ring ②.
5) Remove the hook ③, then remove the LEVER GEAR ASS'Y L ④. Take care not to open the hook ③ too much, otherwise it may get deformed or broken. If it does, replace it.
6) Remove the SPRING COIL ⑤ from the LEVER GEAR ASS'Y ④.
7) Remove the IDLER GEAR L ⑥ and the DOOR OPEN LEVER ⑦.

2. Remounting

1) Apply grease to the axles ⑧, ⑨ and ⑩.
2) Apply grease to the IDLER GEAR L ⑥.
3) Mount the DOOR OPEN LEVER ⑦ onto the axle ⑧. Do it so that the end of the DOOR OPEN LEVER ⑦ leans against the front side of the CASSETTE DOOR ⑪ as shown in Fig. A.
   CASSETTE DOOR ⑪ is built in the front cabinet.
4) Mount the IDLER GEAR L ⑥ onto the axle ⑧.
5) Pass the ROD ASS'Y ① through the hole ⑫. Match position of the COUPLE GEAR L ⑬ and the IDLER GEAR L ⑥ as shown in Fig B.
6) Mount the COUPLE GEAR R as instructed in 5-2-3.
7) Hook the SPRING COIL ⑤ to the LEVER GEAR ASS'Y L ④.
8) Mount the LEVER GEAR ASS'Y L ④ onto the axle ⑨ and the shaft ⑩. Match position to the IDLER GEAR L ⑥ as shown in Fig. B.
9) Mount the COMPL CASSETTE MECHANISM onto the chassis as instructed in 5-2-1.

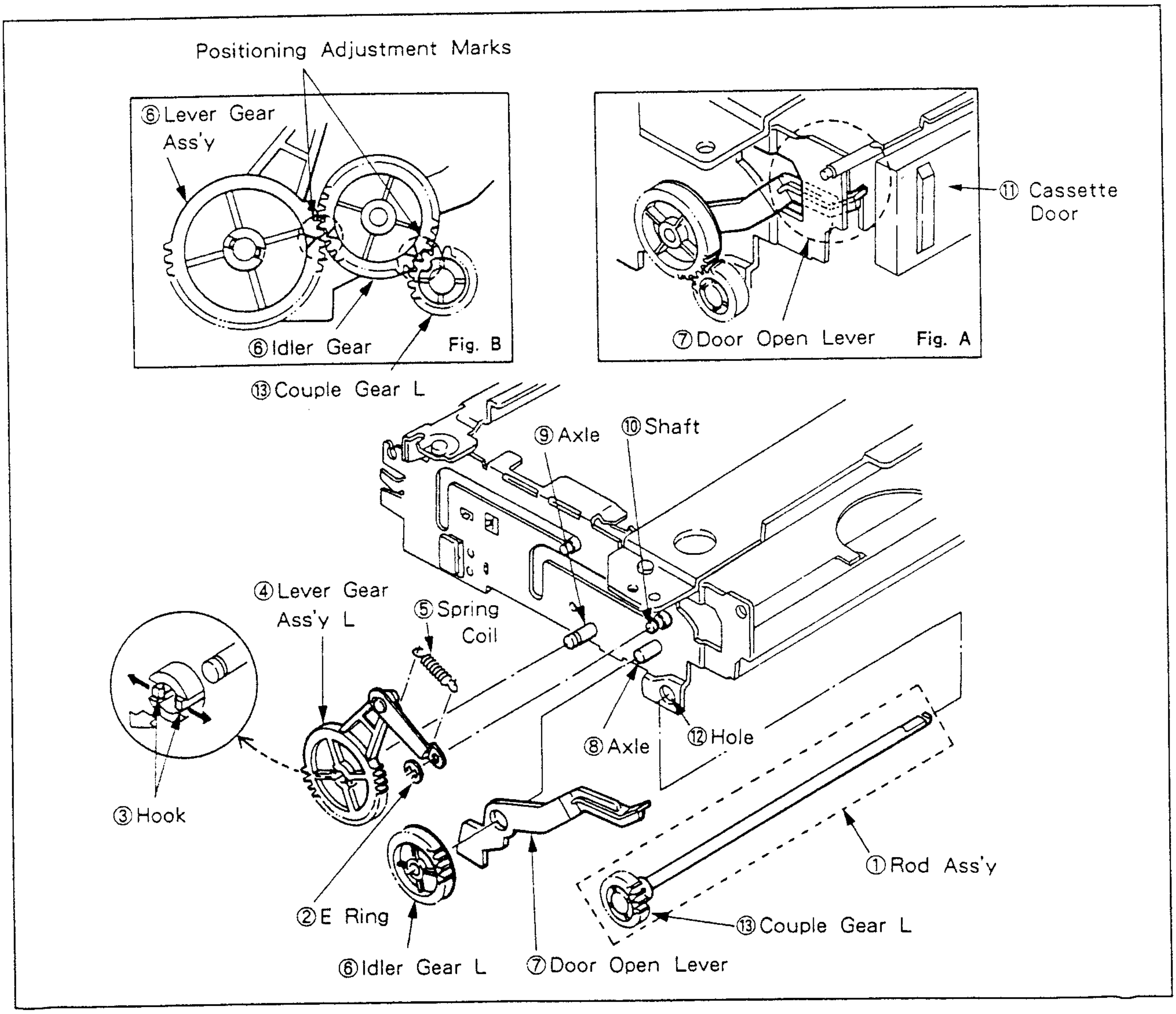

Positioning Adjustment Marks
⑥ Lever Gear Ass'y
⑥ Idler Gear
Fig. B
⑬ Couple Gear L
⑪ Cassette Door
⑦ Door Open Lever
Fig. A
⑨ Axle
⑩ Shaft
④ Lever Gear Ass'y L
⑤ Spring Coil
⑧ Axle
⑫ Hole
③ Hook
① Rod Ass'y
② E Ring
⑬ Couple Gear L
⑥ Idler Gear L
⑦ Door Open Lever

Fig. 5-2-4. Cassette Drive Gears (Left Side)

5-10. FIXED GUIDE, FE HEAD LEVER ASS'Y

5-10-1. Entrance side Fixed Guide, FE Lever Ass'y and Exit side Impedance Roller (See Fig. 5-10-1.)

1. Removal

1) Remove the special nut ①, Then remove the GUIDE PIPE ③ and the special washer ②, in that order.
2) Remove the SPRING COIL ⑤.
3) Remove the FTE HEAD connector.
4) Remove the special washer ⑥, then remove the FE HEAD LEVER ASS'Y ⑦.
5) Remove the screw ⑲, IMPEDANCE HOLDER ⑪ and EXIT SIDE IMPEDANCE ROLLER ⑫ with IMPEDANCE BRACKET ⑬.
6) Open the IMPEDANCE BRACKET hook ⑰ a little and remove the EXIT SIDE IMPEDANCE ROLLER ⑫.

Note: When removing and remounting the impedance roller, handle it carefulley to protect it from scratches and dirt.

2. Remounting

1) Mount the IMPEDANCE BRACKET ⑬ onto the EXIT SIDE IMPEDANCE ROLLER ⑫. Confirm that the hook ⑰ is hooked to the EXIT SIDE IMPEDANCE ROLLER ⑫.
2) Mount the EXIT SIDE IMPEDANCE ROLLER ⑫ onto the AXLE ⑭.
3) While aligning the IMPEDANCE HOLDER hole ⑯ with the protuberance ⑮, mount the IMPEDANCE HOLDER ⑪ to the DRUM BASE ⑱ with the screw ⑲.
4) After mounting the FE HEAD LEVER ASS'Y ⑦ onto the AXLE ⑧, mount the special washer ⑥.
5) Hook the SPRING COIL ⑤ between the chassis notch ⑨ and the FE HEAD LEVER ASS'Y hook ⑩.
6) Mount the special washer ②, the GUIDE PIPE ③ and the special nut ① to the AXLE ⑧, in that order.
7) At that time, do not excessively tighten the special nut to avoid idle rotation of the axle ribet. The height of fixing guide on the inlet side is not required.
8) Connect the connector to the FTE HEAD.

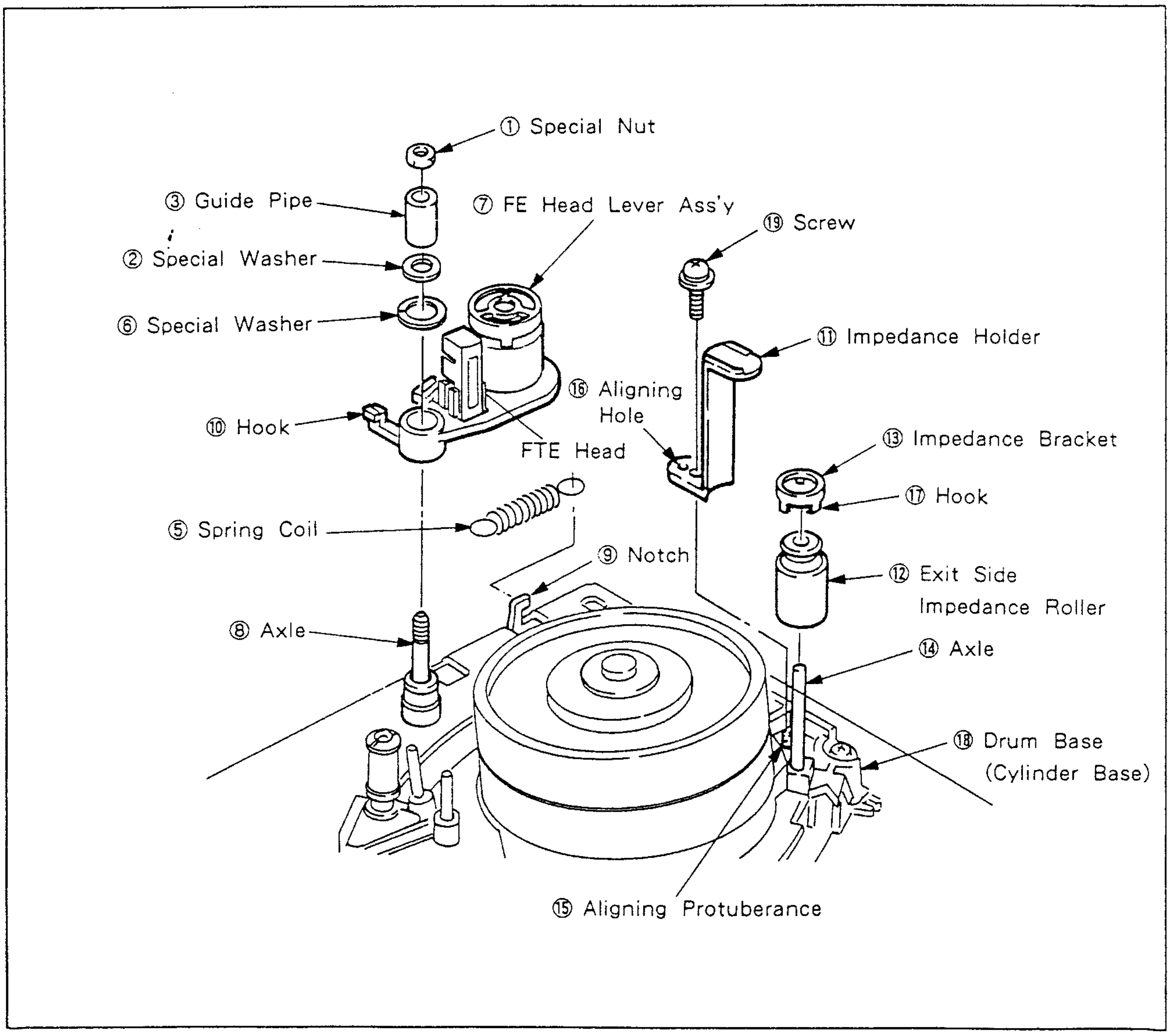

① Special Nut
③ Guide Pipe
⑦ FE Head Lever Ass'y
⑲ Screw
② Special Washer
⑥ Special Washer
⑪ Impedance Holder
⑯ Aligning Hole
⑩ Hook
FTE Head
⑬ Impedance Bracket
⑰ Hook
⑤ Spring Coil
⑨ Notch
⑫ Exit Side Impedance Roller
⑧ Axle
⑭ Axle
⑱ Drum Base (Cylinder Base)
⑮ Aligning Protuberance

Fig. 5-10-1. Entrance side Fixed Guide, FE Lever Ass'y and Exit side Impedance Roller

5-10-2. Entrance side Impedance Roller and FTE Head (See Fig. 5-10-2.)

1. **Removal**

1) Remove the FTE HEAD ① connector.
2) Open the hook ② a little, then remove the IMPEDANCE BRACKET ④.
3) Remove the special washer ⑧, then remove the ENTRANCE SIDE IMPEDANCE ROLLER ③.
4) Open the hook ⑤ a little and remove the FTE HEAD ①.

Note: Take care not to open the hook too much, otherwise it may be deformed or broken.

2. **Remounting**

1) Mount the FTE HEAD ① onto the FE HEAD LEVER ASS'Y ⑥. Confirm that the hook ⑤ is hooked to the FTE HEAD ①.
2) Mount the ENTRANCE SIDE IMPEDANCE ROLLER ③ onto the AXLE ⑦, then mount the special washer ⑧.
3) Mount the IMPEDANCE BRACKET ④ cnto the ENTRANCE SIDE IMPEDANCE ROLLER ③. Confirm that the hook ② is hooked to the ENTRANCE SIDE IMPEDANCE ROLLER ③.
4) Connect the connector to the terminal of the FTE HEAD ①.

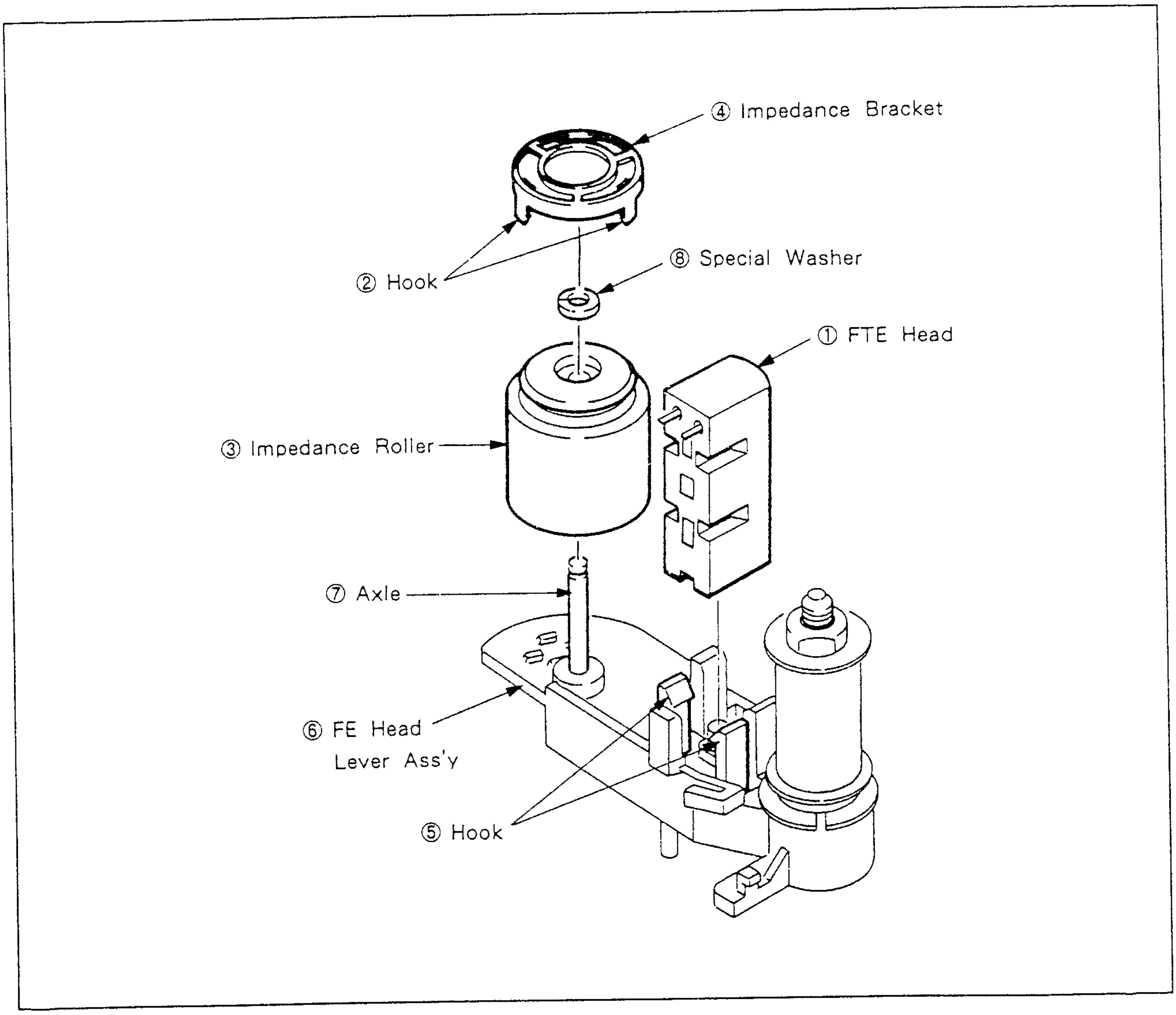

④ Impedance Bracket
⑧ Special Washer
② Hook
① FTE Head
③ Impedance Roller
⑦ Axle
⑥ FE Head Lever Ass'y
⑤ Hook

Fig. 5-10-2. Entrance side Impedance Roller and FTE Head

SANYO

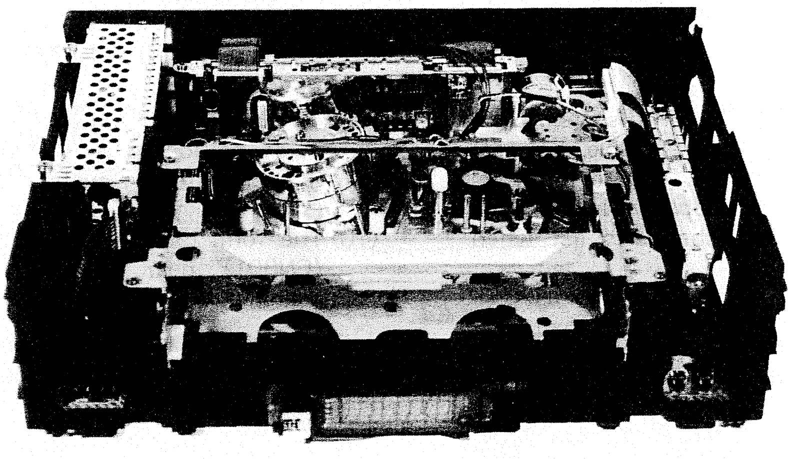
V13974

FILE NO.

Supplement Service Technical Information

Video Cassette Recorder

'92 Midi Mid-Mount Mechanism



VHS
PAL

Use this supplement together with the P90 Mechanism Manual (WM-530599) of the Service Technical Information published in 1990.

-V07879

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REFERENCE No. MS3 1206

1. OUTLINE OF '92 MIDI MID-MOUNT MECHANISM

The '92 Midi mid-mount mechanism is used for video tape recorders shipped as new products of 1993. The '92 Midi mid-mount mechanism has the same basic structures as the P90 mechanism shipped in 1990 except the following. As this manual omits the description of parts which are the same as those of P90, please refer to the P90 Mechanism Service Technical Information.

Note: (9) to (11) of the followings have already been changed in the "P91 mechanism" and repeated in "Service Technical Information of P91 mechanism".

(1) Some models have new reel drive system parts (supply reel table, take up reel table, reel gear (S), reel gear (T), COMPL idler clutch). As these are not interchangeable with the older ones, be sure to check the parts list when replacing them.

(2) The main cam gear, load rack and load gear (T) have been replaced with new ones to further simplify the tape loading mechanism. Therefore, the load cam lever of the old mechanism is not required. The new tape loading mechanism is shown in the figure 2-1.

(3) The MC-2 and MC-3 boards between the loading motor and system control circuit have been replaced with new ones. The MC-2 board incorporated in the HiFi model is different from that incorporated in the MONAURAL model. Therefore when using the mode selector (VHJ-0050) of the service tool, each model will require its own relay board. The MC-2 board used in the HiFi model and MONAURAL model of the 92 Midi mid-mount mechanism can be differentiated as follows.
【HiFi model】
The gilt side of its MC-2 board is marked "T-HiFi" in big letters. Its CN811 connector has 24 pins. VHJ-0092 is used as the relay board.
【MONAURAL model】
The gilt side of its MC-2 board is marked "T-MONO" in big letters. Its CN811 connector has 29 pins. VHJ-0094 is used as the relay board.

(4) The pulley bracket is no longer used and the special screw has been employed. [However, the pulley bracket is stil used in the P90 S VHS mechanism (P91 High speed FF／REW mechanism)]

(5) The shape of the clutch lever assembly has been partially changed and the damper is no longer used.

(6) The shape of the front helical gear of the loading motor has been partially changed and the washer is no longer used.

(7) The 4 screws for mounting the gear bracket assembly of the cassette holder mechanism have been reduced to 3 screws.

(8) Some models do not have the impedance roller.

(9) The height adjustment of the exit side fixed guide no longer required as the precision of the tape running system has been heightened.

(10) The form of MC-1 and MC-4 board connector (CN801) near the reel drive part has been changed.

(11) The auto head cleaner mechanism is used for cleaning the video head automatically during loading and unloading.

2. SECTIONS CHANGED FROM P90 MECHANISM

The page number within the parenthesis above each title mentioned later indicates the page number of the P90 Mechanism Service Technical information. Replace the page numbers with those in the parenthesis on usage.

2-2. DESCRIPTION OF MECHANISM DRIVE

To realize the thin type mechanism, a loading motor and two pieces of cam (MAIN CAM GEAR and the MODE CAM GEAR) to be driven by the said motor are mounted on the upper part of the capstan motor, that was a dead space in the conventional mechanisms hitherto available, with a view to optimization of parts mounting layout. (Fig. 2-1 and Fig. 2-2.)

- Some models do not have the impedance roller.
- The shaded sections are different from P90 mechanism.

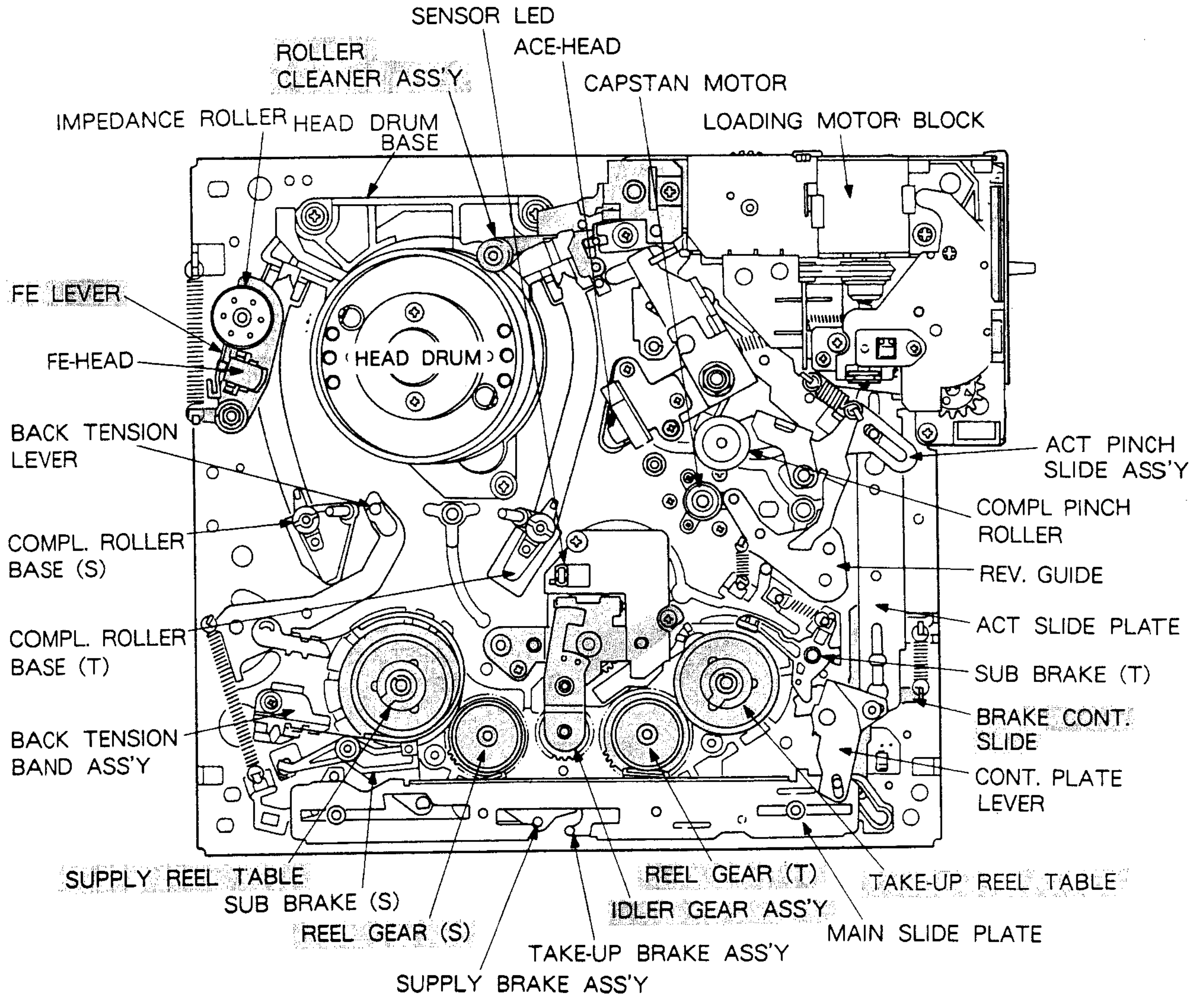

SENSOR LED
ROLLER CLEANER ASS'Y
ACE-HEAD
CAPSTAN MOTOR
IMPEDANCE ROLLER
HEAD DRUM BASE
LOADING MOTOR BLOCK
FE LEVER
FE-HEAD
HEAD DRUM
BACK TENSION LEVER
COMPL. ROLLER BASE (S)
COMPL. ROLLER BASE (T)
BACK TENSION BAND ASS'Y
ACT PINCH SLIDE ASS'Y
COMPL PINCH ROLLER
REV. GUIDE
ACT SLIDE PLATE
SUB BRAKE (T)
BRAKE CONT. SLIDE
CONT. PLATE LEVER
SUPPLY REEL TABLE
SUB BRAKE (S)
REEL GEAR (S)
REEL GEAR (T)
IDLER GEAR ASS'Y
TAKE-UP REEL TABLE
MAIN SLIDE PLATE
TAKE-UP BRAKE ASS'Y
SUPPLY BRAKE ASS'Y
FRONT

Fig. 2-1. Top View of Mechanism (Initial mode)

- Some models do not have the capstan soft brake.
- The shaded sections are different from P90 mechanism.

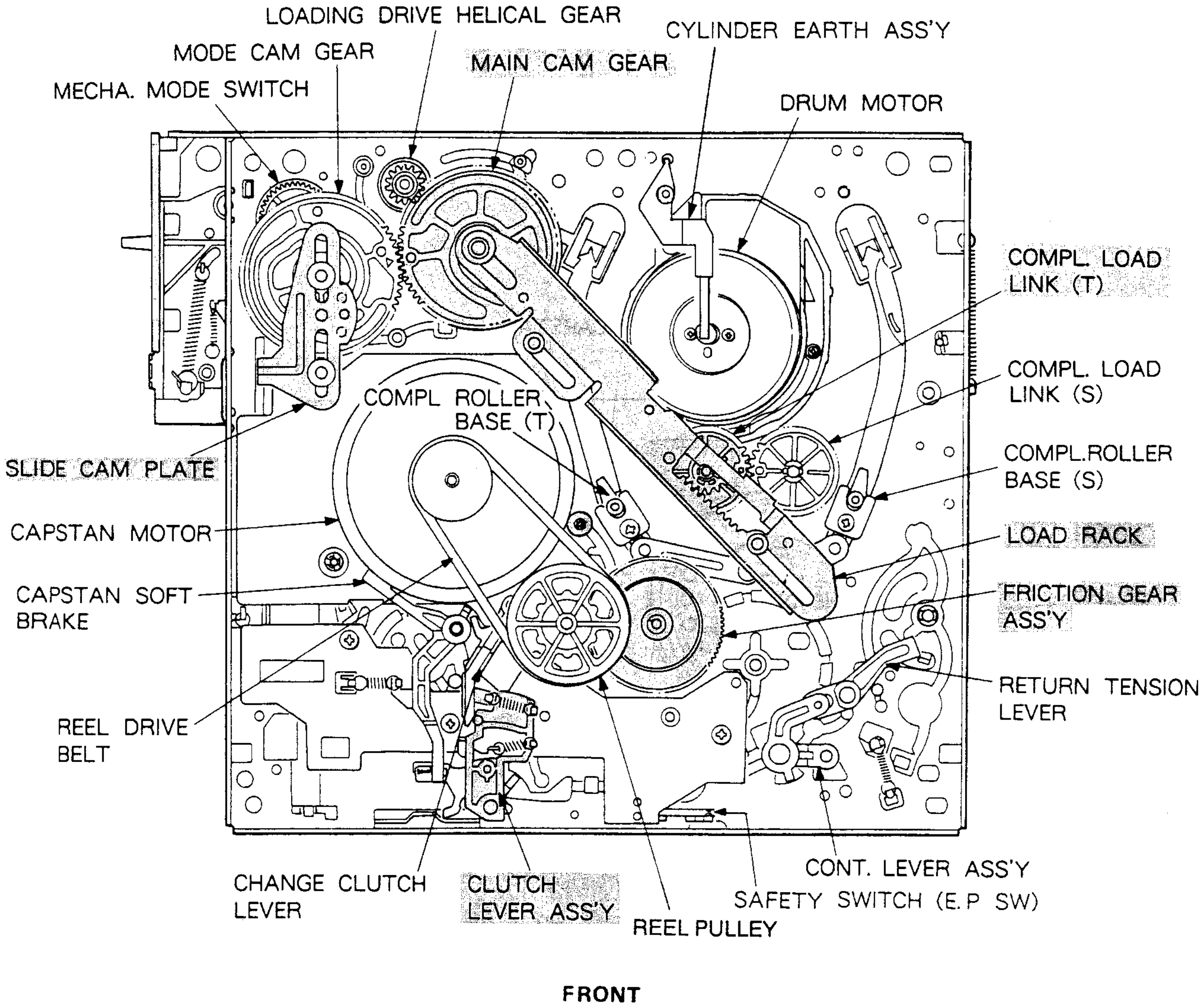

LOADING DRIVE HELICAL GEAR
MODE CAM GEAR
MECHA. MODE SWITCH
MAIN CAM GEAR
CYLINDER EARTH ASS'Y
DRUM MOTOR
COMPL. LOAD LINK (T)
COMPL. LOAD LINK (S)
COMPL.ROLLER BASE (S)
LOAD RACK
FRICTION GEAR ASS'Y
RETURN TENSION LEVER
COMPL ROLLER BASE (T)
SLIDE CAM PLATE
CAPSTAN MOTOR
CAPSTAN SOFT BRAKE
REEL DRIVE BELT
CHANGE CLUTCH LEVER
CLUTCH LEVER ASS'Y
REEL PULLEY
CONT. LEVER ASS'Y
SAFETY SWITCH (E.P SW)
FRONT

Fig. 2-2. Bottom View of Mechanism (Initial mode)

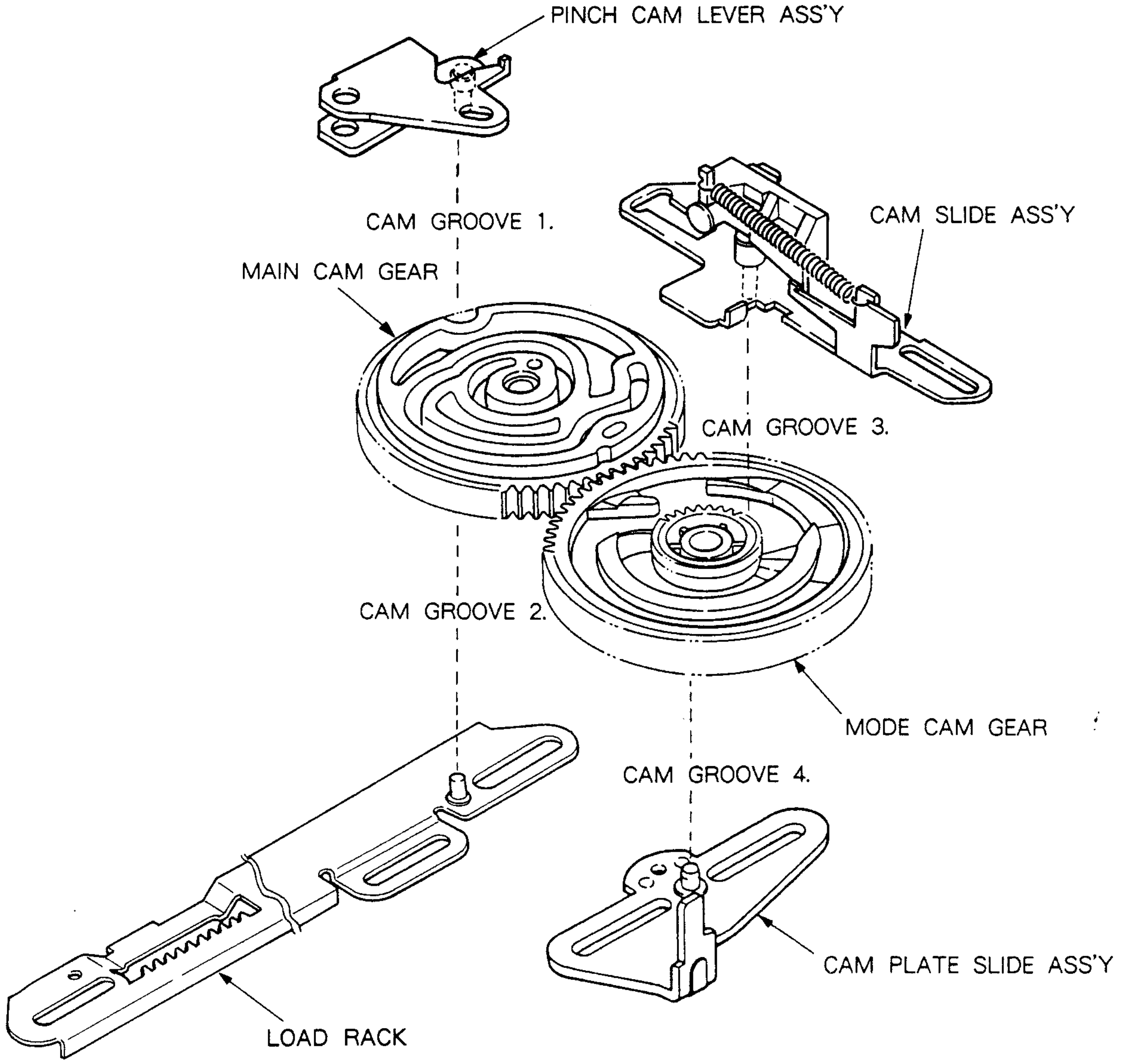

PINCH CAM LEVER ASS'Y
CAM SLIDE ASS'Y
CAM GROOVE 1.
MAIN CAM GEAR
CAM GROOVE 3.
CAM GROOVE 2.
MODE CAM GEAR
CAM GROOVE 4.
CAM PLATE SLIDE ASS'Y
LOAD RACK

Fig. 2-4. View of Cams Construction

(1) Tape Loading Mechanism

The tape loading mechanism is compactly designed with use of a LOAD RACK for loading by drive from the before-mentioned MAIN CAMs with CAM GROOVE 2. The LOAD RACK is laid on the dead space in between the DD capstan motor and the head motor for effective space utilization. (Fig. 6-2-5)

The process from tape pull-out upon loading to contact of the leading guide section with the stopper of drum base and press-fitting under tension of spring is guided and driven in such a manner that the rod is drawn inward from the outer circumferential direction of the CAM GROOVE 2, thereby reducing the load torque (PV value) to the CAM GROOVE. And, the load of the loading motor is minimized to enhance reliability.

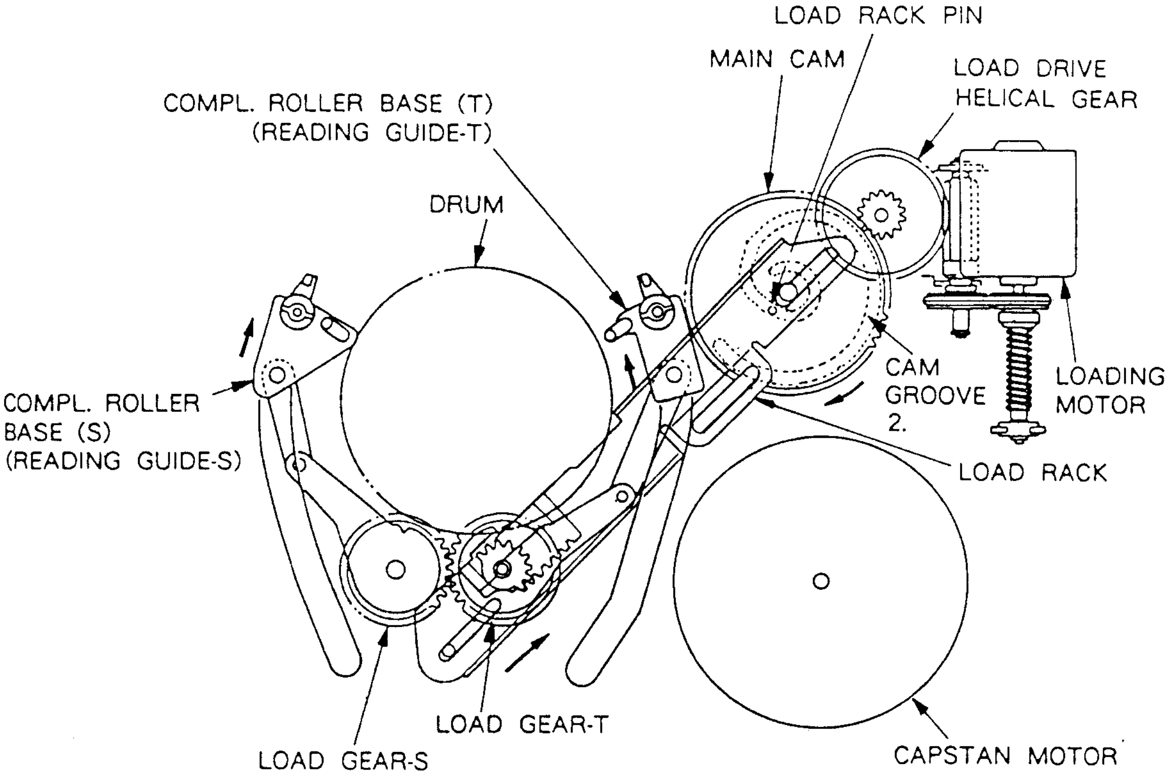

LOAD RACK PIN
MAIN CAM
LOAD DRIVE HELICAL GEAR
COMPL. ROLLER BASE (T) (READING GUIDE-T)
DRUM
COMPL. ROLLER BASE (S) (READING GUIDE-S)
CAM GROOVE 2.
LOADING MOTOR
LOAD RACK
LOAD GEAR-T
LOAD GEAR-S
CAPSTAN MOTOR

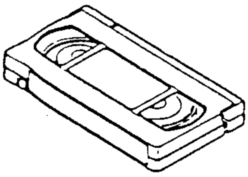
Fig. 2-5. Construction of Tape Loading Mechanism

[Page 28]

4-1-3. Service Jigs

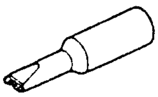
No.	Jig	Jig No.	Remarks
1	Alignment tape	VHJ-0005	SP color bar, 1kHz (normal)
2	Alignment tape	VHJ-0006	SP monoscope, 7kHz (normal)
3	Alignment tape	VHJ-0007	EP monoscope
4	Eccentric screwdriver	VHJ-0003	For tape path adjustment
5	Nut box	VHJ-0048	For fixed guide removal
6	Torque gauge	VHJ-0004	For reel take-up torque measurement
7	Cassette torquemeter	VHJ-0016	For back tension torque measurement
8	Position adjustment gauge	VHJ-0049	For position adjustment
9	Torque gauge screwdriver	VHJ-0014	For screw fastening torque adjustment
10	3mm dia. bit for torque screwdriver	VHJ-0045	Spare bit for the torque gauge screwdriver
11	Video head removing tool	VHJ-0041	For upper drum removal
12	Cassette stand plate gauge	VHJ-0001	For reel height adjustment
13	Mode selector	VHJ-0050	For mechanism mode selection
14	26-pin flexible flat cable	VHJ-0064	Spare cable for mode selector
15	Mode selector relay board	VHJ-0092	Relay board for mode selector (For HiFi model)
16	Mode selector relay board	VHJ-0094	Relay board for mode selector (For monaural model)
17	REV guide lever removing tool	VHJ-0073	REV guide lever removal

VHJ-0005, VHJ-0006, VHJ-0007



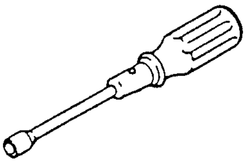
No. 1, 2, 3

VHJ-0003



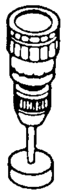
No. 4

VHJ-0048



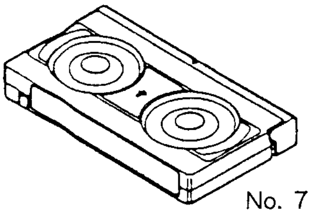
No. 5

VHJ-0004



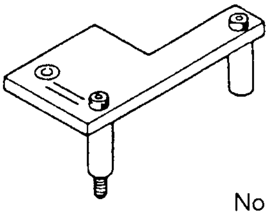
No. 6

VHJ-0016



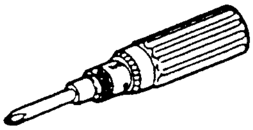
No. 7

VHJ-0049



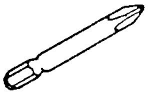
No. 8

VHJ-0014



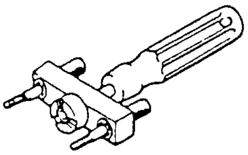
No. 9

VHJ-0045



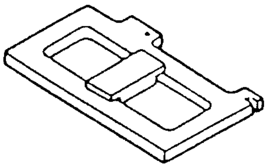
No. 10

VHJ-0041



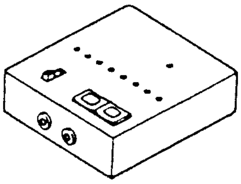
No. 11

VHJ-0001



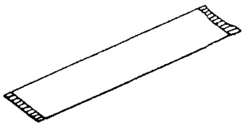
No. 12

VHJ-0050



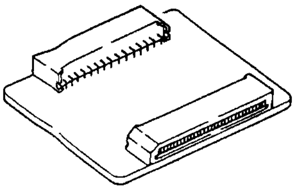
No. 13

VHJ-0064



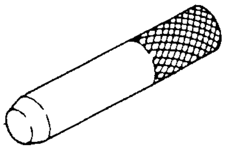
No. 14

VHJ-0092, VHJ-0094



No. 15, 16

VHJ-0073



No. 17

[Page 30]

4-2-3. Connection Method 2 (See Fig. 4-2-3)

The relay board in the Hifi model is different from that used in the monaural model. The gilt side of the MC-2 board of the HiFi model is marked "T-HiFi" while that of the monaural model is marked "T-MONO". Use the following exclusive relay board for each.

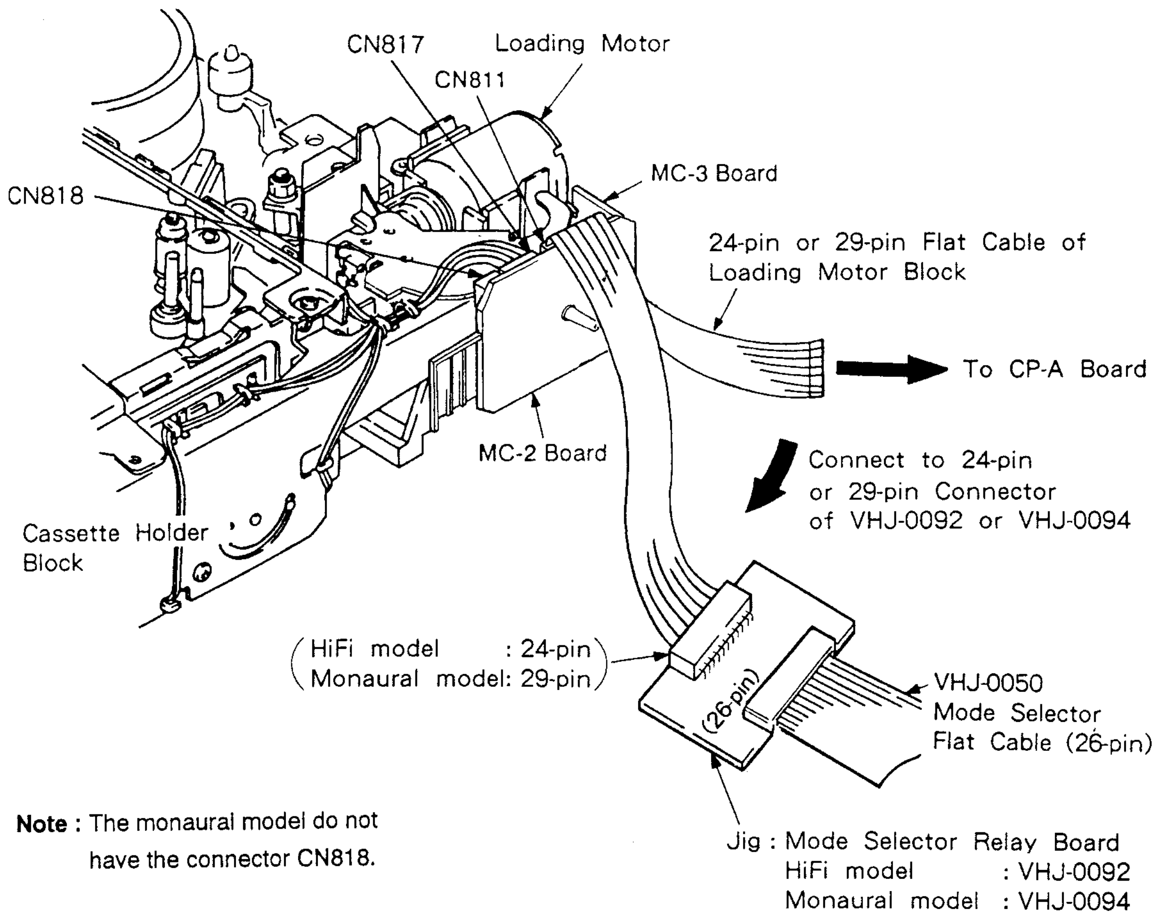
[For HiFi model]

1) Remove the 24-pin flat cable extending from the COMPL MC-2 board connector (CN811) from the connector of the system control circuit board, and connect it to the 24-pin connector of the mode selector relay board (VHJ-0092).
2) Connect the 26-pin flat cable (VHJ-0064) of the mode selector (VHJ-0050) provided between the mode selector body and the 26-pin connector of the mode selector relay board (VHJ-0092).

[For monaural model]

1) Remove the 29-pin flat cable extending from the COMPL MC-2 board connector (CN811) from the connector of the system control circuit board, and connect it to the 29-pin connector of the mode selector relay board (VHJ-0094).
2) Connect the 26-pin flat cable (VHJ-0064) of the mode selector (VHJ-0050) provided between the mode selector body and the 26-pin connector of the mode selector relay board (VHJ-0094).

Note: Care should be taken to avoid mistaking the direction of the contacting side when connecting the flexible flat cable.


CN817
Loading Motor
CN811
MC-3 Board
CN818
24-pin or 29-pin Flat Cable of Loading Motor Block
To CP-A Board
MC-2 Board
Connect to 24-pin or 29-pin Connector of VHJ-0092 or VHJ-0094
Cassette Holder Block
(HiFi model : 24-pin)
(Monaural model: 29-pin)
(26-pin)
VHJ-0050
Mode Selector
Flat Cable (26-pin)
Jig : Mode Selector Relay Board
HiFi model : VHJ-0092
Monaural model : VHJ-0094

Note : The monaural model do not have the connector CN818.

Fig. 4-2-3. Connection

5-2-2. Gear Bracket Ass'y (See Fig. 5-2-2.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the three screws ①, then remove the GEAR BRACKET ASS'Y ② as shown in Fig. A.
3) Remove the E ring ③, then remove the LOCK GEAR ④, the PINION LEVER ASS'Y ⑤, the PINION GEAR ⑥ and the RACK ⑦, in that order.

2. Remounting

1) Apply grease to the shaft ⑧ and the two pins ⑨ of the GEAR BRACKET ASS'Y.
2) Apply grease to the pin ⑩ of the PINION LEVER ASS'Y.
3) Apply grease to the toothed part of the RACK ⑦.
4) Fit the RACK ⑦ onto the two pins ⑨. Align the positioning alignment hole ⑪ to the positioning alignment hole ⑫ of the GEAR BRACKET.
5) Mount the PINION GEAR ⑥, PINION LEVER ASS'Y ⑤, and LOCK GEAR ④ in the shaft ⑧ in the order mentioned.
Align the positioning alignment holes ⑬ of PINION GEAR and LOCK GEAR with the positioning alignment hole ⑪ of RACK at that time.
6) Mount the E ring ③ onto the shaft ⑧.
7) Set the GEAR BRACKET ASS'Y ② to the dowel and mount it using three screws ①.
Align the positioning alignment hole Ⓐ of the IDLER GEAR with the positioning alignment hole Ⓑ of the SIDE BOARD as shown in Fig. 5-2-3 at this time.
Also align the positioning alignment holes ⑬ of PINION GEAR and LOCK GEAR with the positioning alignment hole ⑫ of GEAR BRACKET by referring to Fig. 5-2-2. After mounting them, check to be sure that FL START SWITCH ⑭ is in the ON state shown in Fig. A.
8) Remount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.

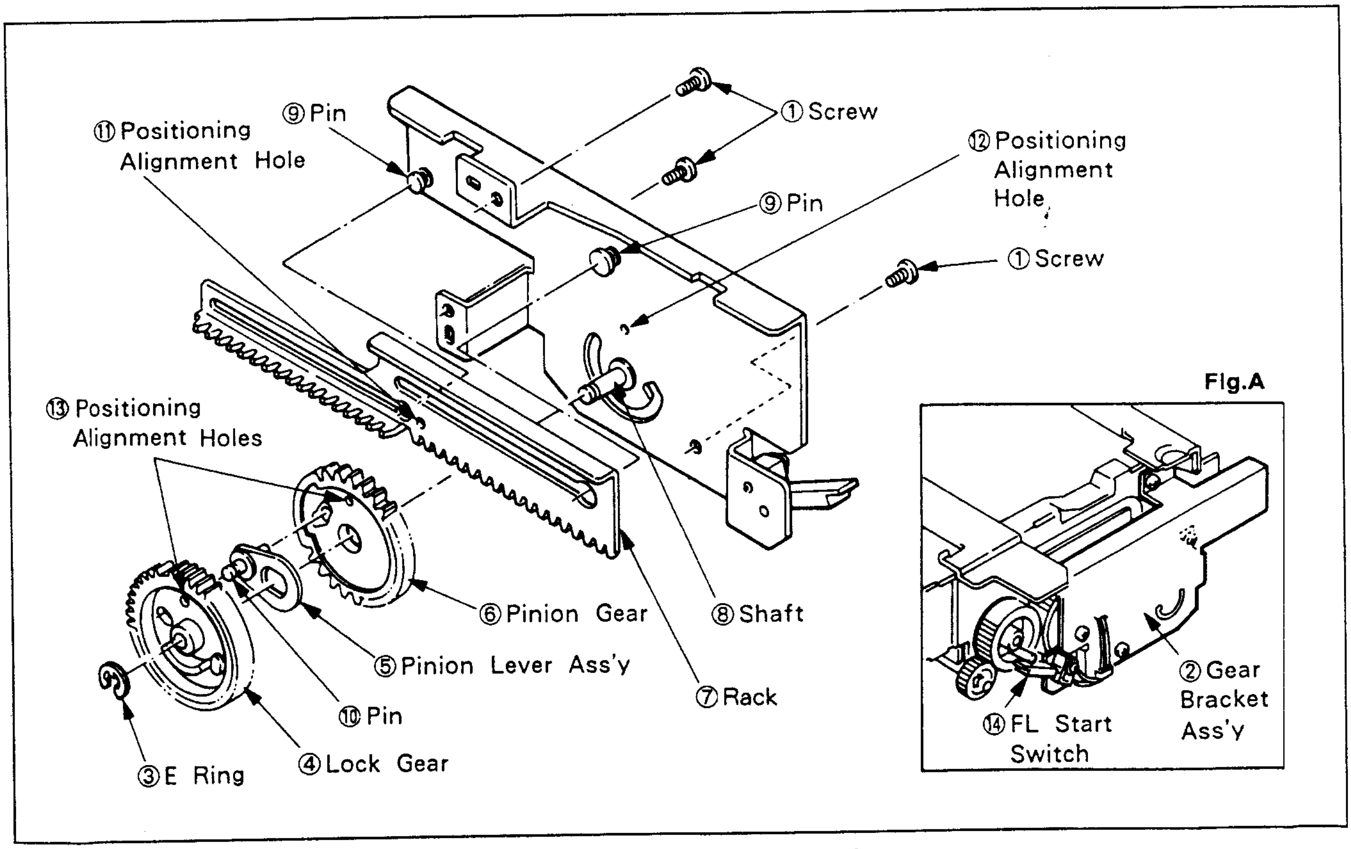

⑪ Positioning Alignment Hole
⑨ Pin
① Screw
⑫ Positioning Alignment Hole
⑨ Pin
① Screw
⑬ Positioning Alignment Holes
Fig.A
⑥ Pinion Gear
⑧ Shaft
⑤ Pinion Lever Ass'y
⑦ Rack
⑩ Pin
③ E Ring
④ Lock Gear
② Gear Bracket Ass'y
⑭ FL Start Switch

Fig. 5-2-2. **Gear Bracket Ass'y**

[Page 36]

5-2-4. Cassette Drive Gear (left) (See Fig. 5-2-4)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the E ring ②.
3) Open the hook ③, then remove the LEVER GEAR ASS'Y L ④. Take care not to open the hook ③ too much, otherwise it may get deformed or broken. If it does, replace it.
4) Remove the SPRING COIL ⑤ from the LEVER GEAR ASS'Y L ④.

2. Remounting

1) Apply grease to the axle ⑨ and shaft ⑩.
2) Align with the COUPLE GEAR L ⑬ and the IDLER GEAR L ⑥ as shown in Fig B.
3) Hook the SPRING COIL ⑤ to the LEVER GEAR ASS'Y L ④.
4) Mount the LEVER GEAR ASS'Y L ④ onto the axle ⑨ and the shaft ⑩. Align with the IDLER GEAR L ⑥ as shown in Fig. B.
5) Mount the COMPL CASSETTE MECHANISM onto the chassis as instructed in 5-2-1.

Note: The end of the DOOR OPEN LEVER ⑦ leans against the front side of the CASSETTE DOOR ⑪ as shown in Fig. A.

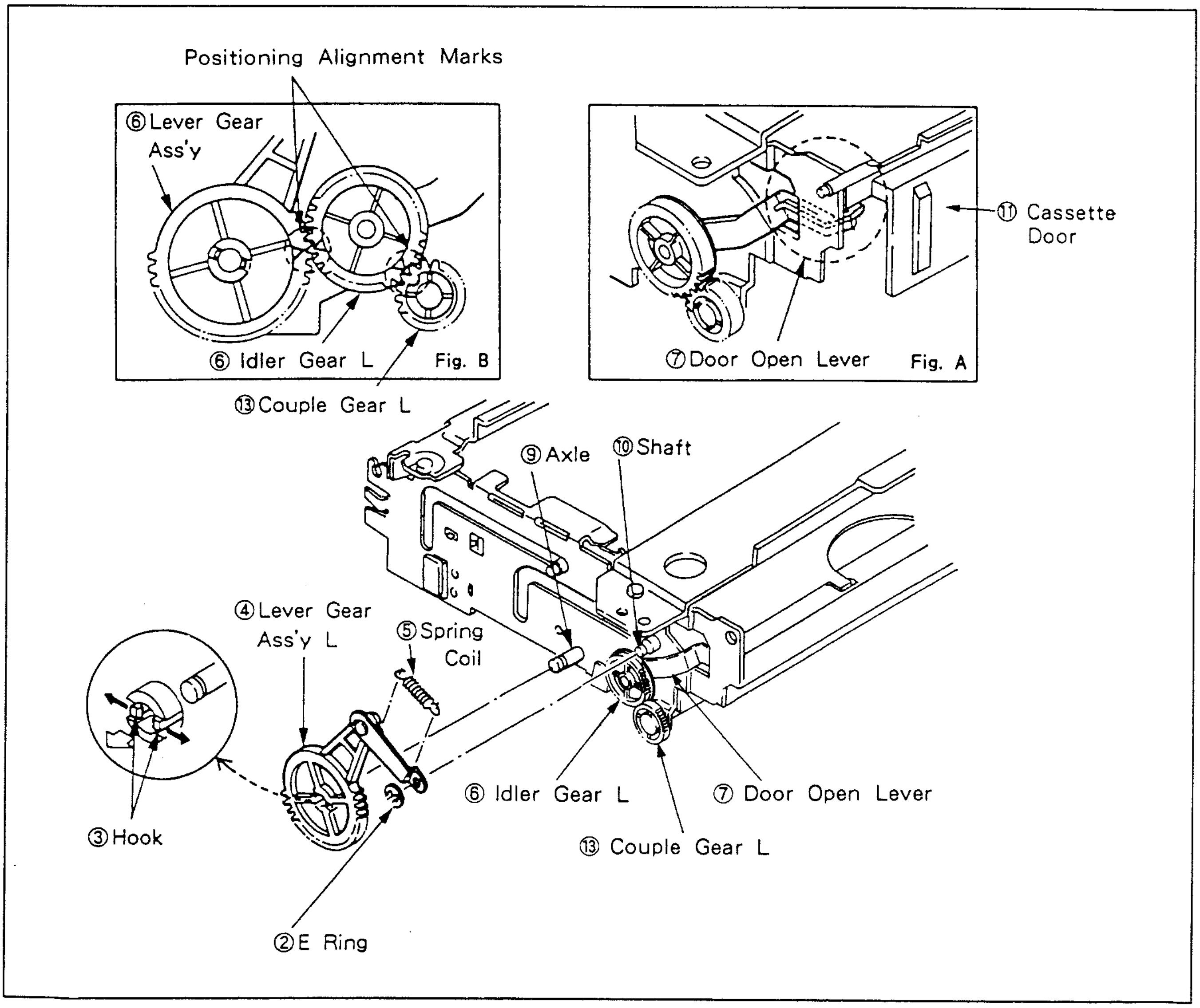

Positioning Alignment Marks
⑥Lever Gear Ass'y
⑥ Idler Gear L
Fig. B
⑬Couple Gear L
⑪ Cassette Door
⑦Door Open Lever
Fig. A
⑨Axle
⑩Shaft
④Lever Gear Ass'y L
⑤Spring Coil
③Hook
⑥ Idler Gear L
⑦ Door Open Lever
⑬ Couple Gear L
②E Ring

Fig. 5-2-4. Cassette Drive Gears (Left Side)

5-6. PINCH ROLLER PRESSURE MECHANISM (See Fig. 5-6-1.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the COMPL HEAD BRACKET as instructed in 5-5.
3) Remove the PINCH SPRING COIL ①.
4) Remove the special washer ②, then remove the PINCH LEVER ASS'Y ③.
5) Remove the REV GUIDE LEVER SPRING COIL ④.
6) Remove REV GUIDE LEVER ASS'Y ⑥ from the hook ⑤ of the plastic bearing on the bottom side. Use a jig VHJ-0073 shown in Fig. 5-6-2 to widen the hook of the plastic bearing. By so doing, the above removal of the REV GUIDE LEVER ASS'Y ⑥ can be made more easily. Care should be taken to avoid pushing the jig VHJ-0073 too much. Pushing it too hard may damage the hook in an extreme case.
7) Remove the SLIDE BRAKE SPRING COIL ⑦.
8) Remove the special washer ⑧, then remove the PINCH CAM LEVER ASS'Y ⑨.
9) Remove the ACT PINCH SLIDE ASS'Y ⑩.

Note: If the hook ⑤ of the plastic bearing is damaged, reference should be made to Section 3. "Method of Repairing the Bearing Section of REV GUIDE LEVER ASS'Y".

2. Remounting

1) Apply grease to pins ⑫/⑬ and axles ⑯/⑱.
2) Apply grease to the ACT PINCH SLIDE ASS'Y pin ⑰.
3) Set the INITIAL mode with the mode selector (VHJ-0050).
4) Mount the ACT PINCH SLIDE ASS'Y ⑩ onto pins ⑫ and ⑬.
5) Insert the pin ⑭ of the PINCH CAM LEVER ASS'Y ⑨ into the MAIN CAM ⑪ GROOVE 1, and mount onto the axle ⑯ while inserting the ACT PINCH SLIDE ASS'Y pin ⑰ of the ACT PINCH SLIDE ASS'Y into the hole ⑮.
6) Mount the special washer ⑧ onto the axle ⑯.
7) Hook the SLIDE BRAKE SPRING COIL ⑦ to the plastic pin ⑲.
8) Mount the REV GUIDE LEVER ASS'Y ⑥ to the plastic molding bearing, then fix it with the hook ⑤ at the bottom.
9) Hook the REV GUIDE LEVER SPRING COIL ④.
10) Mount the PINCH LEVER ASS'Y ③ to the axle ⑱.
11) Mount the special washer ② to the axle ⑱.
12) Hook the PINCH SPRING COIL ① between the ACT PINCH SLIDE ASS'Y ⑩ and the PINCH LEVER ASS'Y ③.
13) Mount the COMPL HEAD BRACKET as instructed in 5-5.
14) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
15) Perform ACE head adjustment as instructed in 6-4.

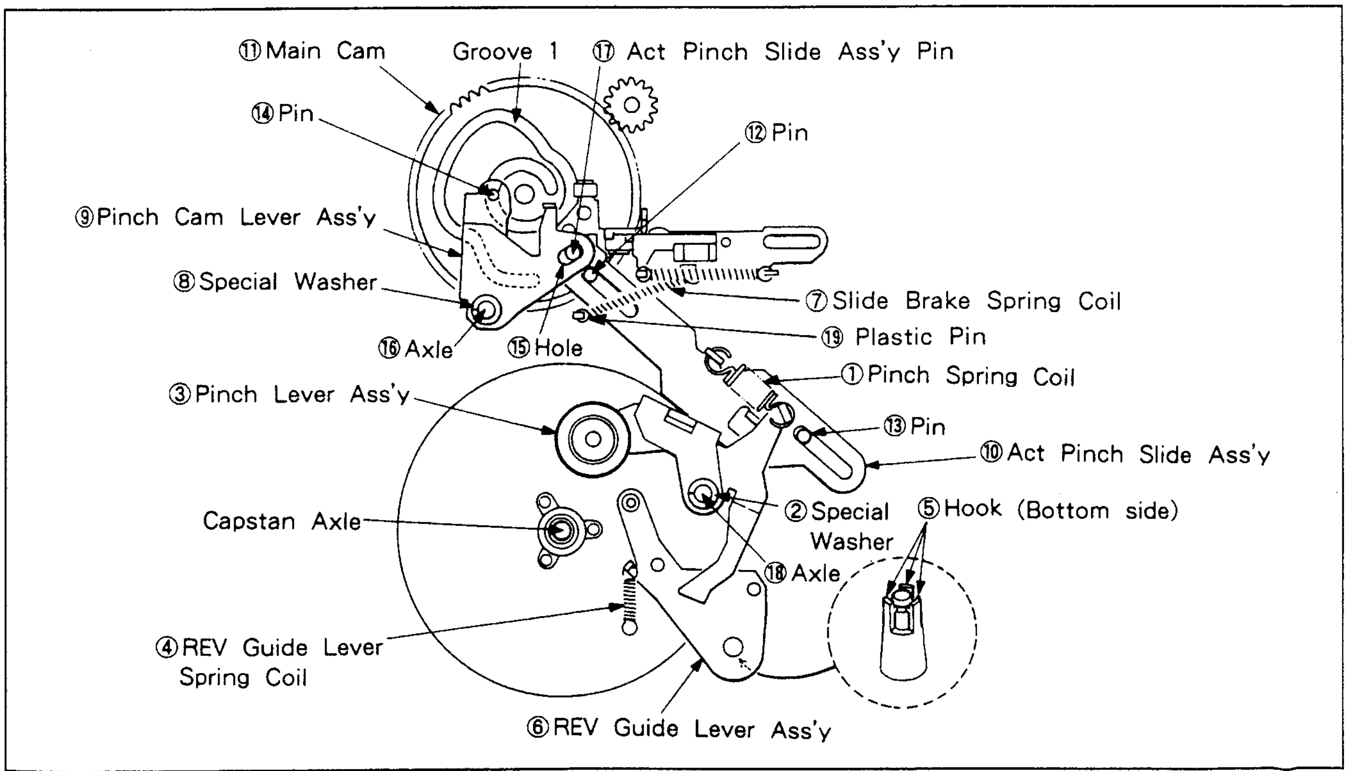

⑪Main Cam
Groove 1
⑰ Act Pinch Slide Ass'y Pin
⑭Pin
⑫Pin
⑨Pinch Cam Lever Ass'y
⑧Special Washer
⑦Slide Brake Spring Coil
⑲ Plastic Pin
⑯Axle
⑮Hole
①Pinch Spring Coil
③Pinch Lever Ass'y
⑬Pin
⑩Act Pinch Slide Ass'y
Capstan Axle
②Special Washer
⑤Hook (Bottom side)
⑱Axle
④REV Guide Lever Spring Coil
⑥REV Guide Lever Ass'y

Fig. 5-6-1. **Pinch Roller Pressure Mechanism**

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5-4. TAPE LOADING MECHANISM

5-4-1. Main Parts of the Tape Loading Mechanism (See Fig. 5-4-1.)

1. Removal

1) Remove connectors from the DRUM MOTOR board (SV-5).
2) Remove the three screws ①, then remove the REINFORCE BRACKET ②.
3) Remove the three special washers ③ and ⑦, then remove the spacer ⑥, LOAD RACK ④ and MAIN CAM ⑧.
4) Unhook the LOAD GEAR T hook ⑩, then remove the LOAD GEAR T ⑨ as shown in Fig. A, with the SPRING COIL ⑪ and the LOAD LEVER ASS'Y T ⑫ attached to it.
5) Unhook the LOAD GEAR S hook ⑭, then remove the LOAD GEAR S ⑬ as shown in Fig. B, with the SPRING COIL ⑮ and the LOAD LEVER ASS'Y S ⑯ attached to it.

Note: Take care not to open the LOAD GEAR hooks too much, otherwise they may be deformed or broken. If they are, replace them.

2. Remounting

1) Apply grease to the hole ⑰ of the LOAD LEVER ASS'Y S ⑯, as shown in Fig. B.
2) Apply grease to the hole ㉒ of the LOAD LEVER ASS'Y T ⑫ as shown in Fig. A, and to the sections of the LOAD GEAR T ⑨ as indicated with an arrow in Fig. C.
3) Apply grease to GROOVE 1, GROOVE 2 and to the outer side of the MAIN CAM ⑧, shown in Fig. E.
4) Apply grease to the three oval holes of the LOAD RACK ④ as shown in Fig. D.
5) Apply grease to the outer surface of axles ⑲, ⑳ and ㉘.
6) After assembling as shown in Fig. B, mount the LOAD GEAR S ⑬ onto the axle ⑲. Insert the ROLLER BASE S pin ⑱ into the hole ⑰ of the LOAD LEVER ASS'Y S.
7) After assembling as shown in Fig. A, mount the LOAD GEAR T ⑨ onto the axle ⑳. When doing so, align the INITIAL mode positioning alignment holes ㉑ of the LOAD GEAR S ⑬ and the LOAD GEAR T ⑨ to the INITIAL mode position. Insert the ROLLER BASE T pin ㉓ into the hole ㉒ of the LOAD LEVER ASS'Y T ⑫.
8) Mount the MAIN CAM ⑧ onto the axle ㉖. At that time, make sure that the INITIAL mode positioning alignment holes ㉕ of the MAIN CAM ⑧ and the MODE CAM ㉔ match the INITIAL mode positioning alignment holes ㉞ of the MECHANISM CHASSIS. Also check to be sure that the pin ㉗ of the CAM PINCH LEVER ASS'Y is put in the GROOVE 1 of the MAIN CAM as shown in Fig. E.
9) Mount the LOAD RACK ④ onto the axles ㉘ and ㉛. At that time, set the INITIAL mode positioning alignment marks ㉚ of the LOAD RACK ④ and the LOAD GEAR T ⑨ to the INITIAL mode position. Insert the LOAD RACK pin ㉙ into the MAIN CAM GROOVE 2 as shown in Fig. E.
10) Mount the spacer ⑥ and the special washer ⑦ onto the axle ㉖.
11) Mount the two special washers ③ onto the two axles ㉛.
12) Mount the REINFORCE BRACKET ② with the three screws ①.
13) Insert the connector into the DRUM MOTOR board (SV-5).
14) Confirm that loading and unloading are performed smoothly.

Note: Be sure to perform INITIAL mode positioning of cams and gears precisely.

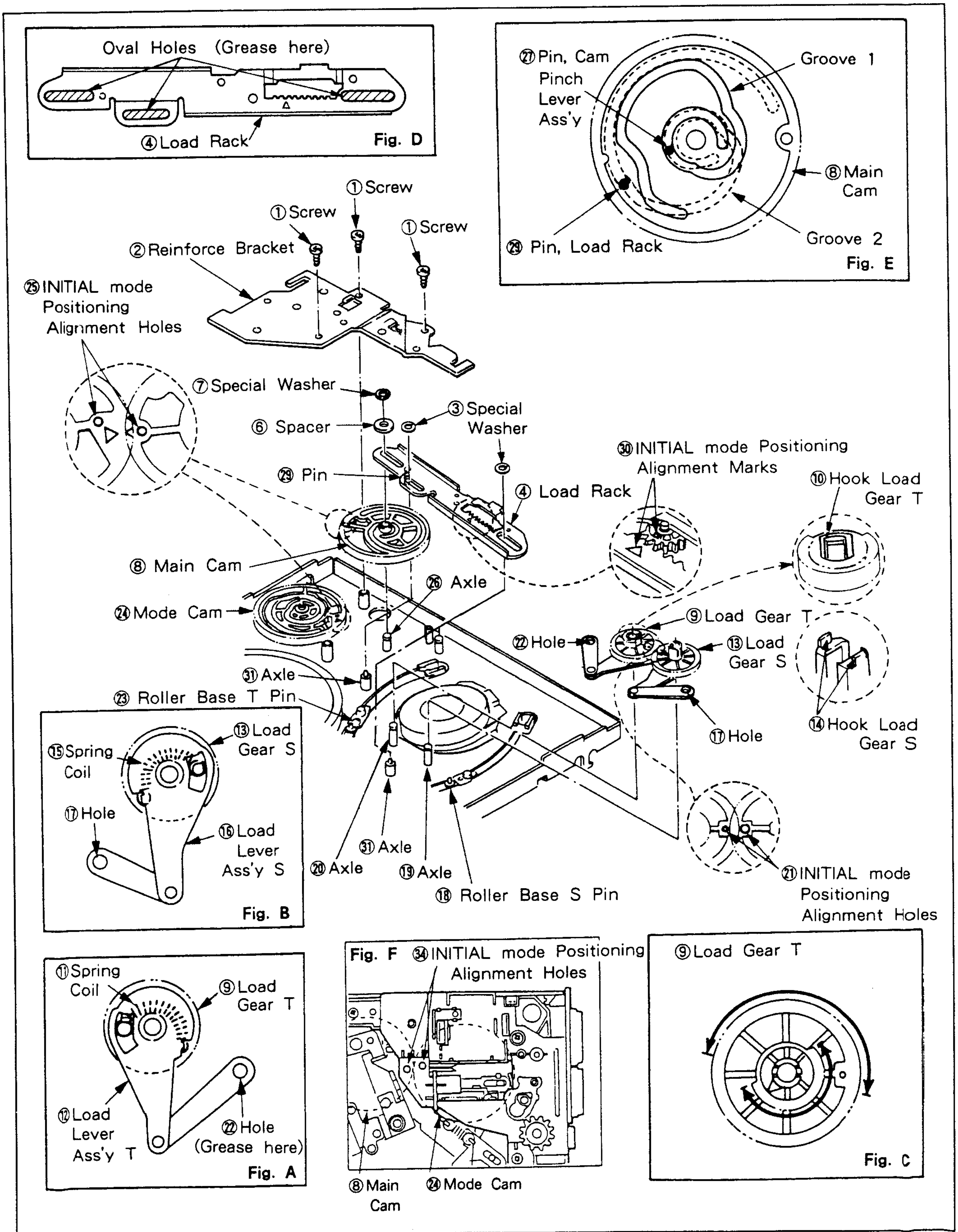
Oval Holes (Grease here)
④Load Rack
Fig. D
㉗Pin, Cam
Pinch
Lever
Ass'y
Groove 1
⑧Main
Cam
Groove 2
㉙ Pin, Load Rack
Fig. E
①Screw
①Screw
①Screw
②Reinforce Bracket
㉕INITIAL mode
Positioning
Alignment Holes
⑦Special Washer
⑥ Spacer
③Special
Washer
㉙ Pin
㉚INITIAL mode Positioning
Alignment Marks
④ Load Rack
⑩Hook Load
Gear T
⑧ Main Cam
㉖ Axle
㉔Mode Cam
⑨Load Gear T
㉒Hole
⑬Load
Gear S
㉛Axle
㉓ Roller Base T Pin
⑰Hole
⑭Hook Load
Gear S
⑬Load
Gear S
⑮Spring
Coil
⑰Hole
⑯Load
Lever
Ass'y S
Fig. B
㉛Axle
⑳Axle
⑲Axle
⑱ Roller Base S Pin
㉑INITIAL mode
Positioning
Alignment Holes
⑪Spring
Coil
⑨Load
Gear T
⑫Load
Lever
Ass'y T
㉒Hole
(Grease here)
Fig. A
Fig. F
㉞INITIAL mode Positioning
Alignment Holes
⑧Main
Cam
㉔Mode Cam
⑨Load Gear T
Fig. C

Fig. 5-4-1. Loading Mechanism Main Parts

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5-8-4. Reel Pulley and Friction Gear Ass'y (See Fig. 5-8-4.)

1. Removal

1) Remove the REEL DRIVE BELT ③.
2) Remove the special washer ④, then remove the REEL PULLEY ⑤.
3) Remove the special washer ⑥, then remove the FRICTION GEAR ASS'Y ⑦ and the washer ⑧.

2. Remounting

1) Apply one drop of oil to the parts of axles ⑨ and ⑩ indicated with arrows.
2) Mount the washer ⑧ and the FRICTION GEAR ASS'Y ⑦ onto the axle ⑨.
3) Mount the special washer ⑥ onto the axle ⑨.
4) Mount the REEL PULLEY ⑤ onto the axle ⑩.
5) Mount the special washer ④ onto the axle ⑩.
6) Set the REEL DRIVE BELT ③.

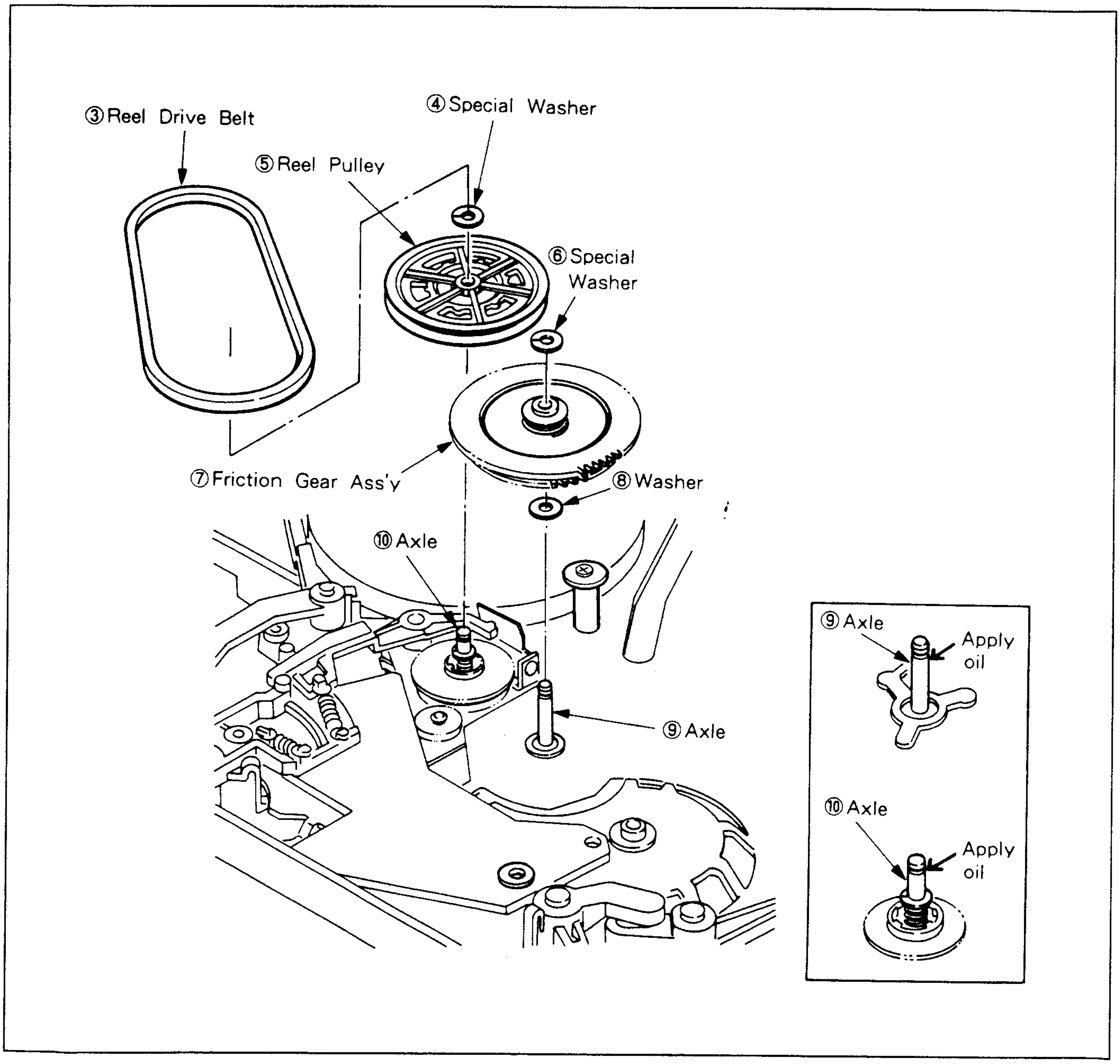

③Reel Drive Belt
④Special Washer
⑤Reel Pulley
⑥Special Washer
⑦Friction Gear Ass'y
⑧Washer
⑩Axle
⑨Axle
⑨Axle
Apply oil
⑩Axle
Apply oil

Fig. 5-8-4. Reel Pulley & Friction Gear

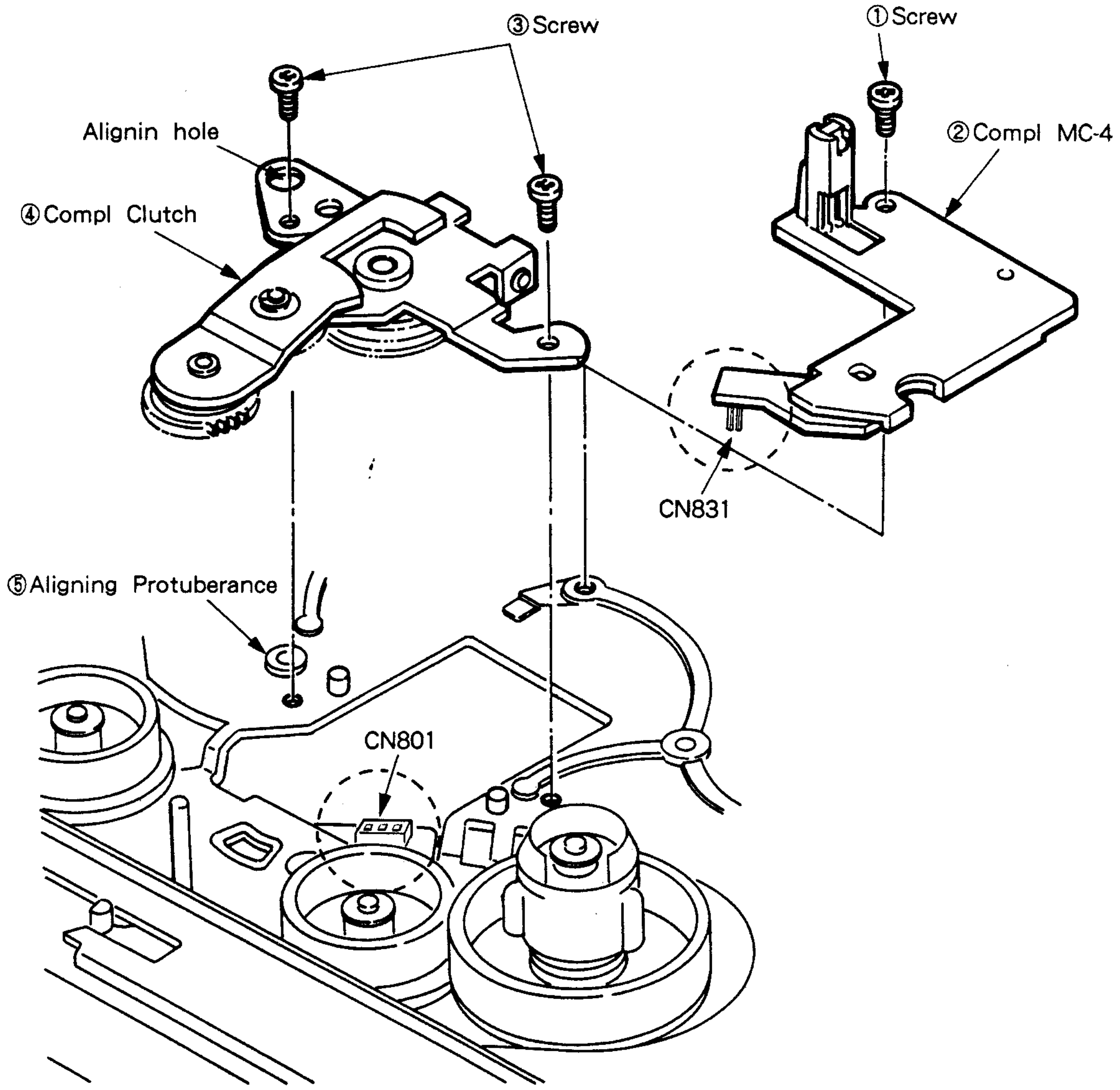
5-8-5. COMPL Clutch (See Fig. 5-8-5.)

1. Removal

1) Remove the COMPL CASSETTE MECHANISM as instructed in 5-2-1.
2) Remove the REEL DRIVE BELT and the REEL PULLEY as instructed in 5-8-4.
3) Remove the screw ①, then remove the COMPL MC-4 ②.
4) Remove the two screws ③, then remove the COMPL CLUTCH ④.

2. Remounting

1) Mount the COMPL CLUTCH ④ with the two screws ③, aligning it with the protuberance ⑤.
2) After inserting the CN831 (COMPL MC-4) into the CN801 (COMPL MC-1), mount the COMPL MC-4 with the screw ①.
3) Mount the REEL PULLEY and REEL DRIVE BELT as instructed in 5-8-4.
4) Mount the COMPL CASSETTE MECHANISM as instructed in 5-2-1.


③Screw
①Screw
Alignin hole
②Compl MC-4
④Compl Clutch
CN831
⑤Aligning Protuberance
CN801

Note: The form of CN801 and CN831 differ from the P90 mechanism.

Fig. 5-8-5. Compl Clutch

5-10. FIXED GUIDE, FE HEAD LEVER ASS'Y

5-10-1. S-Side Fixed Guide and FE Lever Ass'y (See Fig. 5-10-1.)

1. Removal

1) Remove the special nut ①, then remove the GUIDE PIPE ③ and the special washer ② (lower), in that order.
2) Remove the SPRING COIL ⑤.
3) Remove the FTE HEAD connector, then remove the FE HEAD LEVER ASS'Y ⑦.

2. Remounting

1) Mount the FE LEVER ASS'Y ⑦ onto the axle ⑧.
2) Hook the SPRING COIL ⑤ between the chassis notch ⑨ and the FE LEVER ASS'Y hook ⑩.
3) Mount the special washer ② (lower), the GUIDE pipe ③ and the special nut ① to the axle ⑧, in that order. At that time, do not excessively tighten the special nut ① to avoid idle rotation of the axle rivet. The height of fixing guide on the inlet side is not required.
4) Connect the connector to the FTE HEAD.

Note : Some models do not have the impedance roller.

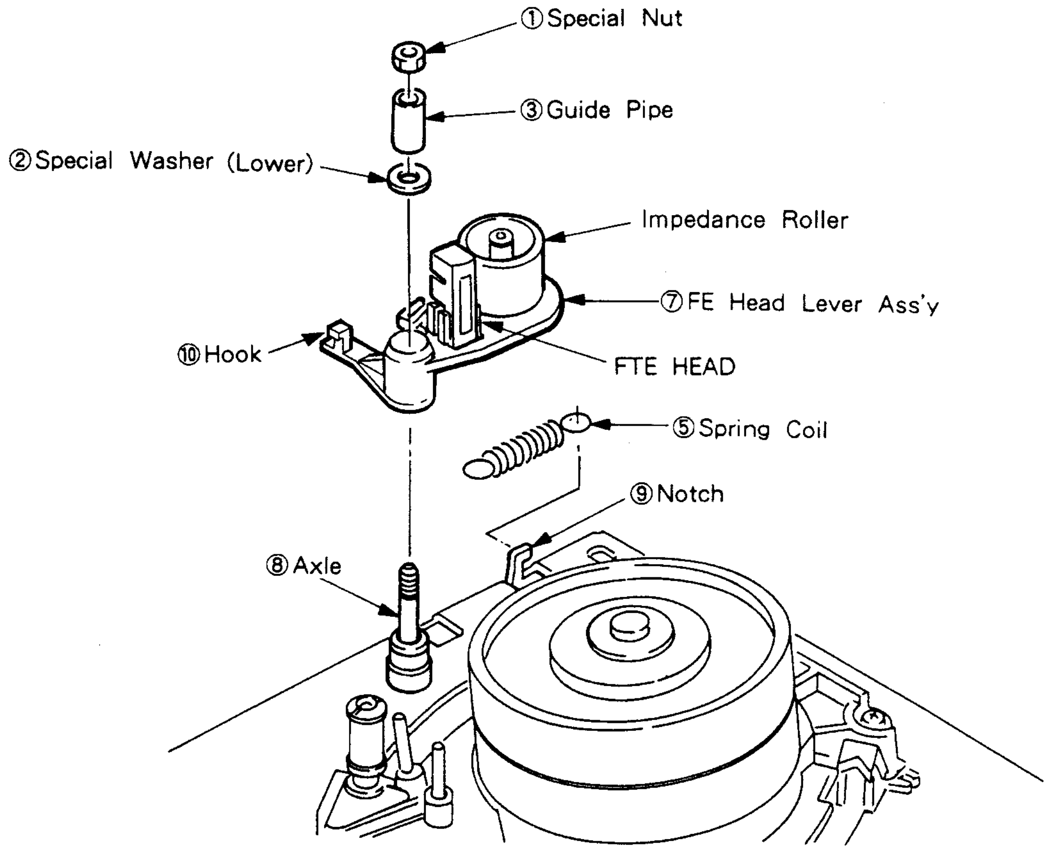

①Special Nut
③Guide Pipe
②Special Washer (Lower)
Impedance Roller
⑦FE Head Lever Ass'y
⑩Hook
FTE HEAD
⑤Spring Coil
⑨Notch
⑧Axle

Fig. 5-10-1. Fixed Guide (S) & FE Lever Ass'y

5-10-3. Exit side Fixed Guide (See Fig. 5-10-3.)

1. Removal

1) Remove the CAP ①.
2) Remove the special NUT ②, then remove the special washer ③ (upper), the GUIDE PIPE ④, the special washer ③ (lower) and the sleeve ⑤, in that order.

2. Remounting

1) Mount the sleeve ⑤, the special washer ③ (lower), the GUIDE PIPE ④, the special washer ③ (upper) and the special NUT ②, in that order, to the axle ⑥.
2) Mount the CAP ① onto the axle ⑥.

Note: There is no need of height adjustment of the exit side fixed guide.

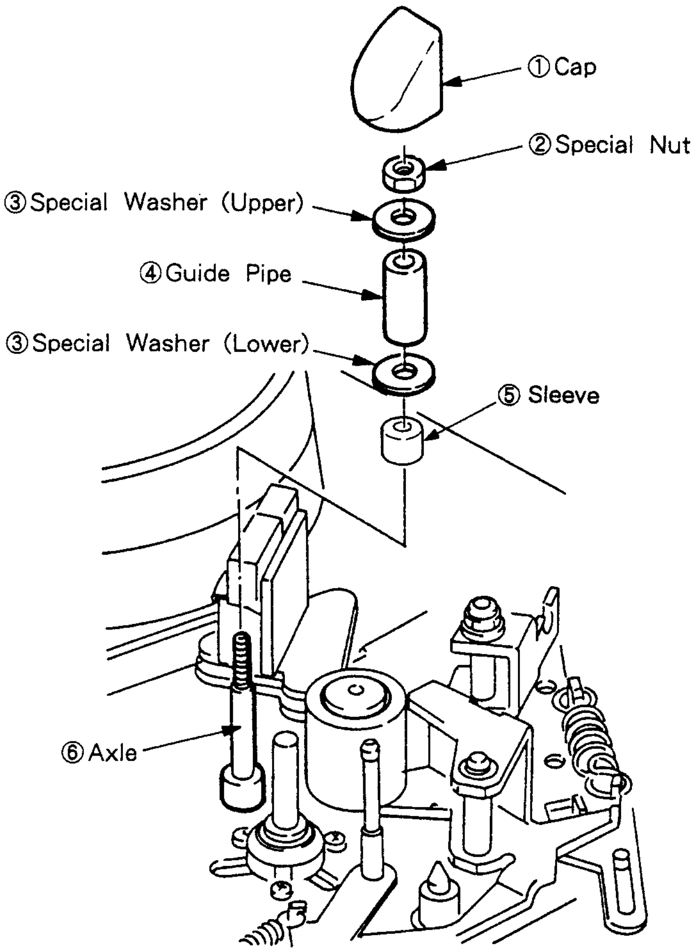

①Cap
②Special Nut
③Special Washer (Upper)
④Guide Pipe
③Special Washer (Lower)
⑤ Sleeve
⑥Axle

Fig. 5-10-3. Fixed Guide (T)

5-11. DRUM SECTION

5-11-1. Drum Motor(rotor, stator)(See Fig. 5-11-1.)

1. Removal

1) Referring to 5-4-1 in this SUPPLEMENT, remove the special washer and the LOAD RACK.
2) Remove the screw ①, then remove the CYLINDER EARTH ASS'Y ②.
3) Remove the two screws ③, then remove the ROTOR ④ and SPACER.
4) Remove the STATOR board connector ⑩.
5) Remove the three screws ⑤, then remove the STATOR ⑥.

2. Remounting

1) Mount the STATOR ⑥ with the three screws ⑤.
2) Mount the SPACER ⑪ on to the AXLE ⑫.
3) While aligning the ROTOR oval hole ⑦ with the ROTOR DISK hole ⑧, mount the ROTOR with the two screws ③.
4) Insert the connector ⑩.
5) While aligning the CYLINDER EARTH ASS'Y ② protuberance with the chassis hole ⑨, mount it with the screw ①.
6) Referring to 5-4-1 in this SUPPLEMENT, attach the LOAD RACK and the special washer. It is needed that the LOAD RACK is to be set correctly to the LOAD GEAR T.

Note 1: Use a torque driver (VHJ-0014) for mounting the STATOR ⑥ and the ROTOR ④. Set fastening torque to 3kg-cm.

Note 2: When the drum unit has been replaced, perform a tape path adjustment as instructed in 6-4. and perform a CH-1/CH-2 switching position adjustment of the servo circuit.

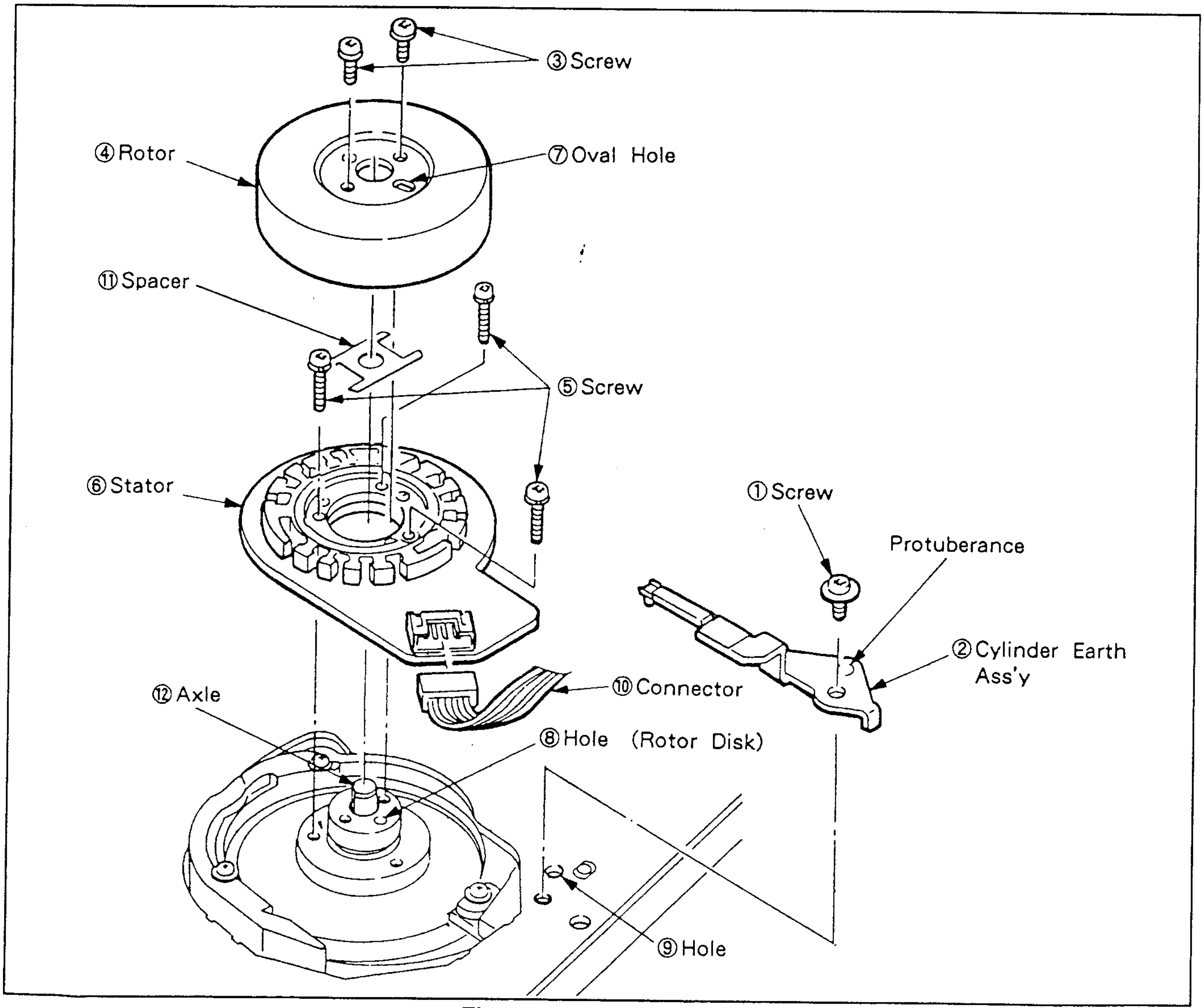

③Screw
④Rotor
⑦Oval Hole
⑪Spacer
⑤Screw
⑥Stator
①Screw
Protuberance
②Cylinder Earth Ass'y
⑫Axle
⑩Connector
⑧Hole (Rotor Disk)
⑨Hole

Fig. 5-11-1. Drum Motor

5-13. AUTO HEAD CLEANER MECHANISM (See. Fig. 5-13-1 • Fig. 5-13-2 • Fig. 5-13-3)

1. Removal

Note:
- Do not hold the ROLLER CLEANER ASS'Y ① by bare hand. Use tweezers and gloves not soiled with grease or dust, etc.
- When the cleaning function deteriorates and replacing only ROLLER CLEANER ASS'Y ①, there is no need to perform item 4).

1) Make sure that the ROLLER CLEANER ASS'Y ① is not pressed against a drum (cylinder).
2) Remove the PRE-AMP UNIT and the PRE-AMP BRACKET.
3) Remove screw ②, then lift up and remove the BRACKET CLEANER ASS'Y ③.
4) With the BRACKET CLEANER ASS'Y ③ is fixed by finger, turn the LEVER CLEANER ASS'Y ④ 35° to 40° to clockwise, then lift up and remove.
5) Remove the stop washer ⑤, then remove the ROLLER CLEANER ASS'Y ①.

2. Remounting

1) Mount the ROLLER CLEANER ASS'Y ① and the stop washer ⑤ to the axle ⑥ of LEVER CLEANER ASS'Y.
   Mount the ROLLER CLEANER ASS'Y ① so that the mark shown in Fig. 5-13-2 is up side. If the mark is down side, noise may occur.
2) Mount the SPRING COIL ⑧ and the LEVER CLEANER ASS'Y ④ to the axle ⑦ of BRACKET CLEANER ASS'Y. At this time, hook the SPRING COIL ⑧ to the hole ⑨ of the LEVER CLEANER ASS'Y and the bent part ⑩ of the BRACKET CLEANER ASS'Y. "A part" of the LEVER CLEANER ASS'Y should be under "B part" of the BRACKET CLEANER ASS'Y.
3) Fix the BRACKET CLEANER ASS'Y ③ on screw hole ⑫ by screw ②. Before fasten screw ②, insert hole ⑪ of the BRACKET CLEANER ASS'Y to axle ⑯, axle ⑦ to hole ⑬ to match positions. Pin ⑭ of the LEVER CLEANER ASS'Y should be run along the circumference of the MAIN CAM ⑮ not to be came off.
4) The upper side of the lower drum should be within approx. 2mm from the lower side of the ROLLER CLEANER ASS'Y as shown in Fig. 5-13-3.
5) Mount the PRE-AMP BRACKET and the PRE-AMP UNIT.

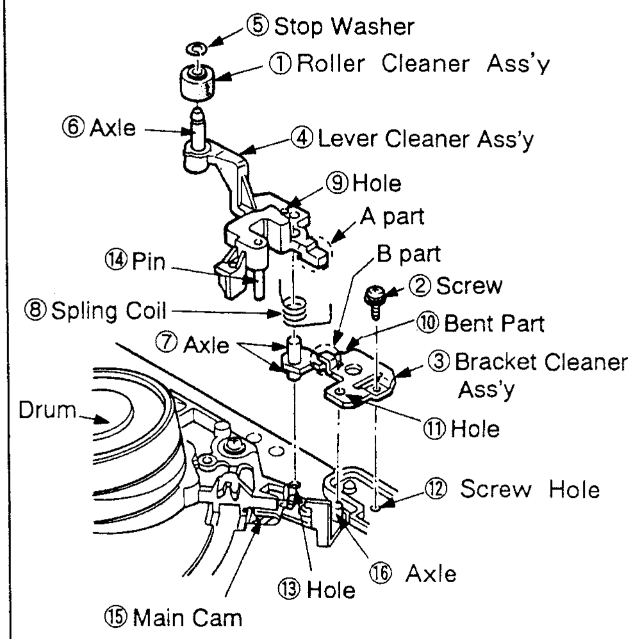

⑤ Stop Washer
① Roller Cleaner Ass'y
⑥ Axle
④ Lever Cleaner Ass'y
⑨ Hole
A part
⑭ Pin
B part
② Screw
⑧ Spling Coil
⑩ Bent Part
⑦ Axle
③ Bracket Cleaner Ass'y
Drum
⑪ Hole
⑫ Screw Hole
⑯ Axle
⑬ Hole
⑮ Main Cam

Fig. 5-13-1

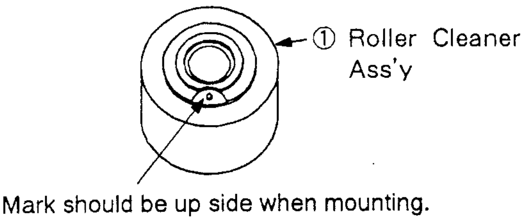

① Roller Cleaner Ass'y
Mark should be up side when mounting.

Fig. 5-13-2

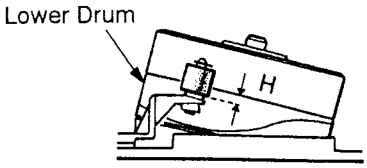

Lower Drum
H

Fig. 5-13-3